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PREHISTORY AND HISTORY OF THE EL DORADO LAKE AREA, KANSAS, PHAS--ETC(U)

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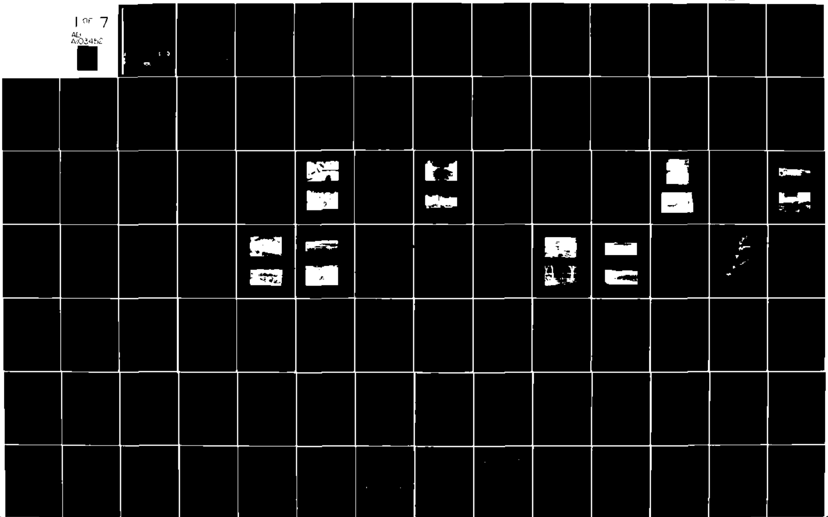

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PROJECT REPORT SERIES

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Project Report Series

Number 47

LEVEL II

PREHISTORY AND HISTORY OF THE EL DORADO LAKE AREA, KANSAS (PHASE II)

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Lawrence, Kansas
1981

ABSTRACT

Archeological investigations at El Dorado Lake have continued to focus on recovery of data pertinent to the goals of the project, as defined in the original research design (Leaf 1976). The goals are to retrieve data and test hypotheses on: (1) the synchronic and diachronic interrelationships among subsistence and settlement systems and (2) the environmental conditions to which those systems were adapted. These goals pertain to both prehistoric and historic periods with research objectives accomplished by site reconnaissance, testing and extensive data recovery excavations, and an interdisciplinary analytical approach to understanding human adaptive responses. This report is the second in a series devoted to understanding prehistoric and historic human lifeways of the Upper Walnut River Valley.

The report presents studies focused on the Walnut River terrace system and associated sediments, results of systematic tests of prehistoric sites, results of extensive data recovery operations at components representing Plains Woodland and Plains Village cultural affiliations, and site reconnaissance and systematic tests of historic resources within the project area. In addition, the historic archeology benefited from an extensive literature search of valuable data concerning the early settling and development of the frontier town of Chelsea, Kansas.

PREFACE

This report fulfills, in part, obligations for archeological and historical investigations at El Dorado Lake during 1978, as stated in the Phase II scope of work statement accompanying Contract No. DACW-77-C-0221 between the U.S. Army Corps of Engineers (Tulsa District) and the University of Kansas. The dam to result in El Dorado Lake is currently under construction across the Walnut River in Butler County, south-central Kansas. According to the scope of work, archeological investigations were to include salvage excavations at 14BU9 and 14BU55 and systematic test excavations of several prehistoric sites imminently threatened by railroad and interstate reroute construction. Paleoenvironmental studies, focused on the Walnut River terrace system and associated sediments, were also outlined in this proposal. The historical investigations were to include a literature search by an historian and a field survey by an historical archeologist.

Investigations of prehistoric and historic sites and of the paleogeography of the area were conducted by personnel from the Museum of Anthropology, University of Kansas, during an eight week period in the summer of 1978. During a period of approximately 39 weeks following the completion of the field work, the data were cataloged and analyzed. The chapters in this report are directly concerned with a description of the field investigations and of the data retrieved.

Chapter 1 summarizes the methods and results of paleogeographical investigations and is oriented toward the reconstruction of the paleoenvironmental history of the area. Such a reconstruction will allow inferences concerning past human occupations in the area.

As an aid to the readers and to the following chapters, Chapter 2 presents a description of the cherts of the El Dorado area. Identified as occurring within a 50 km radius of the town of El Dorado, the locations of outcrops, characteristics, and internal structures of the cherts are discussed.

Chapter 3 describes the systematic test excavations of four sites: 14BU16, 14BU81, 14BU89, and 14BU87. These sites were selected for investigation due to their proximity to construction activities resulting from the relocation of portions of I-35 and the Atchison, Topeka, and Santa Fe railroad. The test excavations obtained data concerning the number, areal extent, internal structure and cultural affiliation of archeological components recognized at each site. The potential significance of each site as an archeological and cultural resource was determined and recommendations for further excavation or management are discussed in this chapter for each site.

The Woodland occupation of the Snyder site (14BU9) is the focus of Chapter 4. Discussions are oriented toward several problem areas which have been delineated and highlighted by past investigations of the site. This chapter is, therefore, concerned with the location of intact cultural

deposit(s), related house structures, activities and settlement types, and radiocarbon dating of the material.

Investigations of the Two Deer site (14BU55) are reported in Chapter 5. Initial tests of this site in 1975 indicated its potential in fulfilling project-oriented goals, such as the reconstruction of settlement-subsistence patterns and the local continuity between two major cultural phases. This chapter presented Two Deer as a transitory Plains Woodland-Plains Village site and discusses the artifact inventory, structures, and subsistence of the prehistoric occupation.

The following three chapters are analytical studies which focus on the interrelationships among prehistoric settlement and subsistence systems and the environmental conditions and resources to which they were adapted. Chapter 6 is a paleoethnobotanical analysis of charred remains recovered from the Woodland components on 14BU9 and 14BU31. In Chapter 7, the ceramic collections from 14BU9 are presented according to a behavioral chain analysis. The analysis of mammalian fauna recovered from excavations prior to 1978 at 14BU9 is presented in Chapter 8.

Chapter 9 provides a study of the historical period of the project area based on a literature search, data derived from interviews with local informants, and pedestrian field surveys and related documentary data (maps, land records, etc.). Six historic sites were tested in 1978 to determine the productivity and value of historic sites in the area. The sites tested were 14BU1001, 14BU1002, 14BU1003, 14BU1005, 14BU1006, and 14BU1007. Results of these tests are reported in Chapter 10. An evaluation of their significance for possible inclusion in the National Register of Historic Places is also contained in this chapter. Both this chapter and the preceding one are oriented toward the delineation of a cultural resource management plan for historic sites in the area. Supplementary to the chapters on historic sites archeology is Appendix 10.A, an analysis of the nails recovered from excavations of the historic sites.

This report includes both descriptive presentations and specific analyses of paleogeographical, prehistoric, and historic investigations. In a multi-phase operation, such as the El Dorado Lake project, this report represents yet another step toward a more complete understanding of past lifeways.

ACKNOWLEDGEMENTS

We gratefully acknowledge and appreciate the financial support, facilities, and equipment provided by the Tulsa District, Corps of Engineers, and the Museum of Anthropology, University of Kansas.

Many individuals contributed effort and assistance toward the successful completion of this report. While many of these people are acknowledged at the conclusion of each chapter, several individuals deserve additional recognition. Special thanks goes to Dr. Alfred E. Johnson, Director of the Museum of Anthropology, who served as principal investigator on this project. In addition, his editorial advice and assistance is much appreciated. Daphne Derven, Tulsa District Archaeologist and Contract Administration, patiently guided and administrated various aspects of this project. Dr. Paul Brockington, also with the Museum of Anthropology, offered valuable editorial assistance and photographic advice during several occasions.

The editor acknowledges the authors of the chapters contained herein for contributing to the report and sharing the burden of analysis and report preparation. Jo Anne Maxwell deserves a very special thank-you for typing this manuscript. Kathy Pate, secretary of the Museum of Anthropology, University of Kansas, assisted in the final stages of preparation, in addition to the long hours she spent guiding the project through difficult moments. Ricky Roberts, Ken Wilcox, and John Parisi devoted long hours proofing the final copy and completing last minute odds and ends.

DEDICATION

In Memory of

Madge Jones
1908 - 1979

Director, Butler County
Historical Society Museum

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CHAPTER 1

LATE QUATERNARY HISTORY AND PALEOGEOGRAPHY OF THE EL DORADO LAKE AREA, KANSAS: SECOND REPORT

Darrell Drew

Abstract

This paper summarizes present knowledge of the paleogeography of the El Dorado Lake area, Butler County, Kansas, which has been derived for the construction of a paleogeographic model applicable to prehistoric human occupation. Prior to this study, little pertinent data had been recorded. Sources of information and results of field investigations are discussed. Included are sections on interpretative problems and limitations, upland sediments and stratigraphy, origin of the upland regolith, upland to valley transition zone, valley sediments and stratigraphy, and floodplain and terraces. These are followed by a summary of major geological relations, discussions of horizontal and vertical subdivision of the culture bearing upper alluvium, and a brief statement concerning sources of human mineral resources. Considerations are given to the relationship between this study and other selected areas in the midwest. Compared with El Dorado Lake are the Coffey site, Koster site, Little Blue sites, Pomme de Terre sites, Birch Creek, and Hominy Creek. The report is concluded with a statement concerning suggested future and ancillary research.

Introduction

This paper is a summary of the current state of knowledge derived from paleogeographical investigations conducted for the El Dorado Lake project, Butler County, Kansas. The goal of the paleogeographical research is the construction of a paleogeographic model which can be related to prehistoric human occupation of the area. Although the oldest yet discovered archeological remains here do not exceed 5000 years in age, the model should extend well beyond that to provide a larger framework to which future discoveries may be related, both locally and regionally. Thus, the model should focus, at least, on the period of known New World human occupation, which is approximately the last 12,000 years, or about half of the Late Quaternary time span. Indeed, it should cover the entire Late Quaternary, if evidence of this period can be obtained.

The paleogeographic model must ultimately be based on geologic processes and geologic sediments, including their contents and their stratigraphic relationships. Involved are investigations dealing with the description and interpretation of subsurface materials, from the surface to the bedrock contact (i.e., of the regolith). Specific investigations are necessary to determine: (1) bedrock configuration, (2) regolithic components and limits, (3) stream histories, (4) terrace locations and relationships, (5) organic sequences, (6) unconformities, and (7) dates. Involved are

studies of landforms; sediments; stratigraphy; paleosols; and fossil, faunal, and floral remains. Providing evidence is obtainable, these emphases can lead to the establishment of sequences of Late Quaternary geologic events, including climatic, faunal, vegetational, cultural, and geomorphological components. Further, depending on the degrees of refinement of these, a sound basis for prediction of archeological site locations is possible. This could be of particular value in attempts to extend the cultural record back in time.

Previous Geologic Studies

The El Dorado Lake project is located on the upper Walnut River and its tributaries, just to the northeast of the city of El Dorado, Butler County, Kansas (Fig. 1.1). It covers an area of about 14,000 acres and is approximately 14 km. north to south and 10 km. east to west, at its greatest dimensions. The planned reservoir will occupy a large portion of the western half of the northeastern quarter of the county; this is entirely within the Flint Hills physiographic division. A summary of the area's physiography and prior geologic knowledge appears in the first report of the current study (Drew 1979). Little pertinent geologic information specific to the project area existed before this study. Prior to 1978, geologic work conducted in the region pertained primarily to deep subsurface bedrock studies for oil exploration (Fath 1921; also unpublished data on file with the Kansas Geological Survey, Lawrence), and later to the water quality of the Walnut River consequent to its pollution by the oil industry (Leonard 1972). Limited exploration had been done to locate sources of lithic building materials, such as gravel and limestone (Hargadine 1969). Also, Kansas Department of Transportation geologists conducted several upper level subsurface studies related to the construction of highways and railroads (unpublished field notes and profiles on file at the Kansas Department of Transportation, Topeka). With instigation of the dam project, similar studies were carried out in relation to the building of new park and access roads, and to the re-alignment of existing roads and rail lines (unpublished field notes and profiles on file at Kansas Department of Transportation offices in Topeka and El Dorado, Kansas, and with U.S. Army Corps of Engineers offices in Tulsa, Oklahoma and El Dorado, Kansas). All these upper level investigations involved transects of cores with depths varying in relation to study purposes. The dam construction itself called for knowledge of building materials and information pertaining to foundation footings, and this led to a series of cores being taken around the proposed dam area (unpublished field notes and profiles on file with U.S. Army Corps of Engineers offices in Tulsa, Oklahoma and El Dorado, Kansas). Two existing smaller dams within project boundaries (for Lake Bluestem and Lake El Dorado) also had required similar study (unpublished field notes and profiles on file with the Office of the City Engineer, El Dorado, Kansas). However, to the author's knowledge, Quaternary paleoenvironmental research in the upper Walnut River Valley had never been attempted prior to 1978, when the University of Kansas began a survey with this orientation.

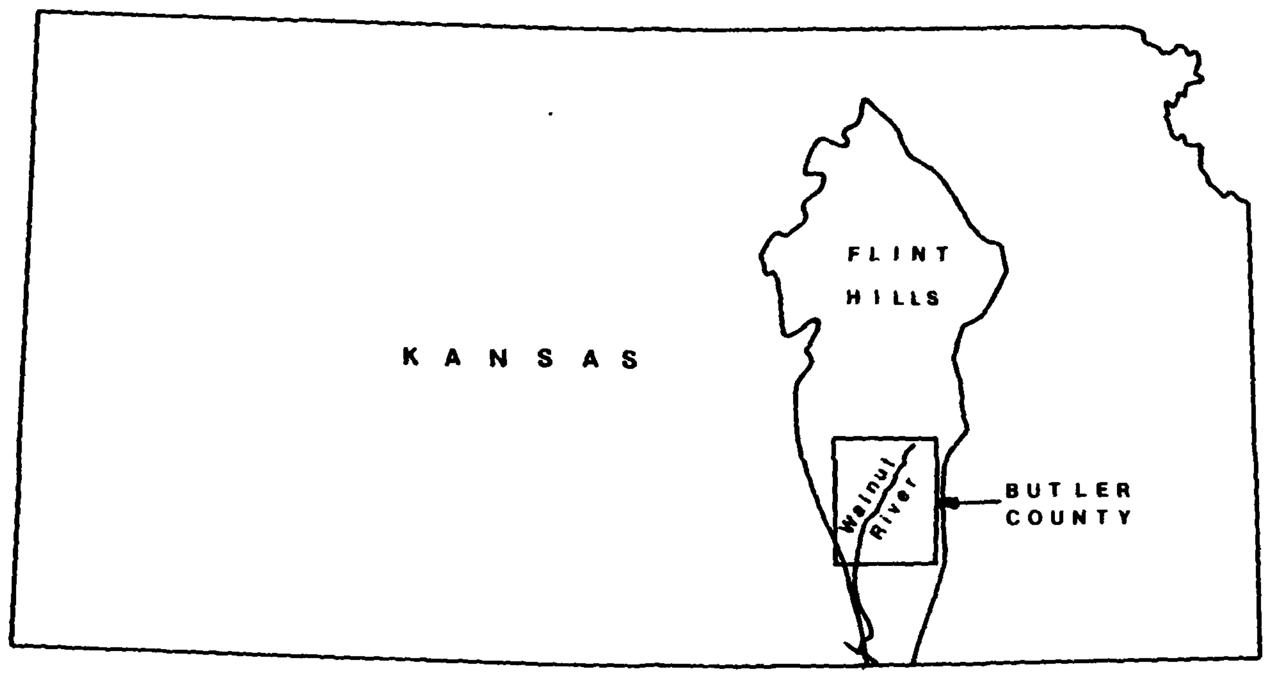

Figure 1.1. The El Dorado Lake project is located along the Walnut River in the northeastern quadrant of Butler County, Kansas.

Field Work at El Dorado Lake

Sources of Information

As previously described (Drew 1979), the bedrock of the area is Permian limestone with interbedded thin shale layers. The bedrock itself is important to this study mainly in its relationship with the overlying regolith, as will be discussed later. Certain limitations relating to the accessibility of the regolith should be noted, as an introduction to a discussion of the derivation of geologic data used in the interpretations to follow. In the uplands, very few natural exposures exist, and surfaces are grass covered, with some areas in crops. Much subsurface information must come from areas excavated for field ponds. Further, the streams traversing the uplands tend to flow through bedrock in their upper reaches, and to be heavily vegetated downstream. In the Walnut River Valley itself, the floodplain areas are mostly in crops or otherwise covered with thick vegetation which conceals surface materials. The Walnut River (Fig. 1.2) and several of its tributaries are deeply incised, as much as 8-9 m. in places. However, little information has been obtained from these banks. A detailed aerial photo and topographic map study followed by a concerted effort to locate good exposures resulted in the discovery of only one of any consequence, and nothing of importance was obtained from it. These banks are heavily covered with vegetation and roots in most places and where they are not, they are covered with a slope-wash glaze and/or debris. Trees grow directly out of the banks, even at water level (Fig. 1.3). Banks are often vertical, with perennial water below and vegetation above, and are difficult to reach. Usually, where not vertical, they are sloped due to slumping, which makes them of little value for study.

These conditions necessitate a reliance on artificial exposures for the collection of subsurface geologic information. Thus, almost all data have been gathered from drill holes, backhoe trenches, bulldozer cuts, and from borrow pits opened in various construction activities throughout the area. In addition, the relatively shallow archeological site excavations provide information of a limited nature. Some knowledge has also been derived from the occurrence of the largest recorded flood in this drainage (Fig. 1.4) during which time the author was present to observe the results.

Borrow pits have proven to be the best sources of information in the determination of sediment types and stratigraphic sequences. They extend to bedrock in places, and contain as complete a record of deposits as can be found anywhere in the project area. Large pits just upstream from the dam, excavated for materials used in the dam, provided initial information to which other areas were then related. Four sites were selected for bulldozer cuts to produce vertical faces. The first of these cuts (T25S, R6E, Sec. 30, N½SE¼SW¼; Fig. 1.5, 12) included a cross section of an ancient stream channel, and this location was used as a type site to which later work was referred. This geological site is located about 150 m. above the dam, and about 1 km. southeast of the Walnut River. At least three other paleochannels, believed to be of the same age, occur in the next kilometer to the southeast of it, in the same exposure. All of these

Figure 1.2. Typical view of the Walnut River main channel, El Dorado Lake project.

Figure 1.3. Typical view of a stream bank, El Dorado Lake project.

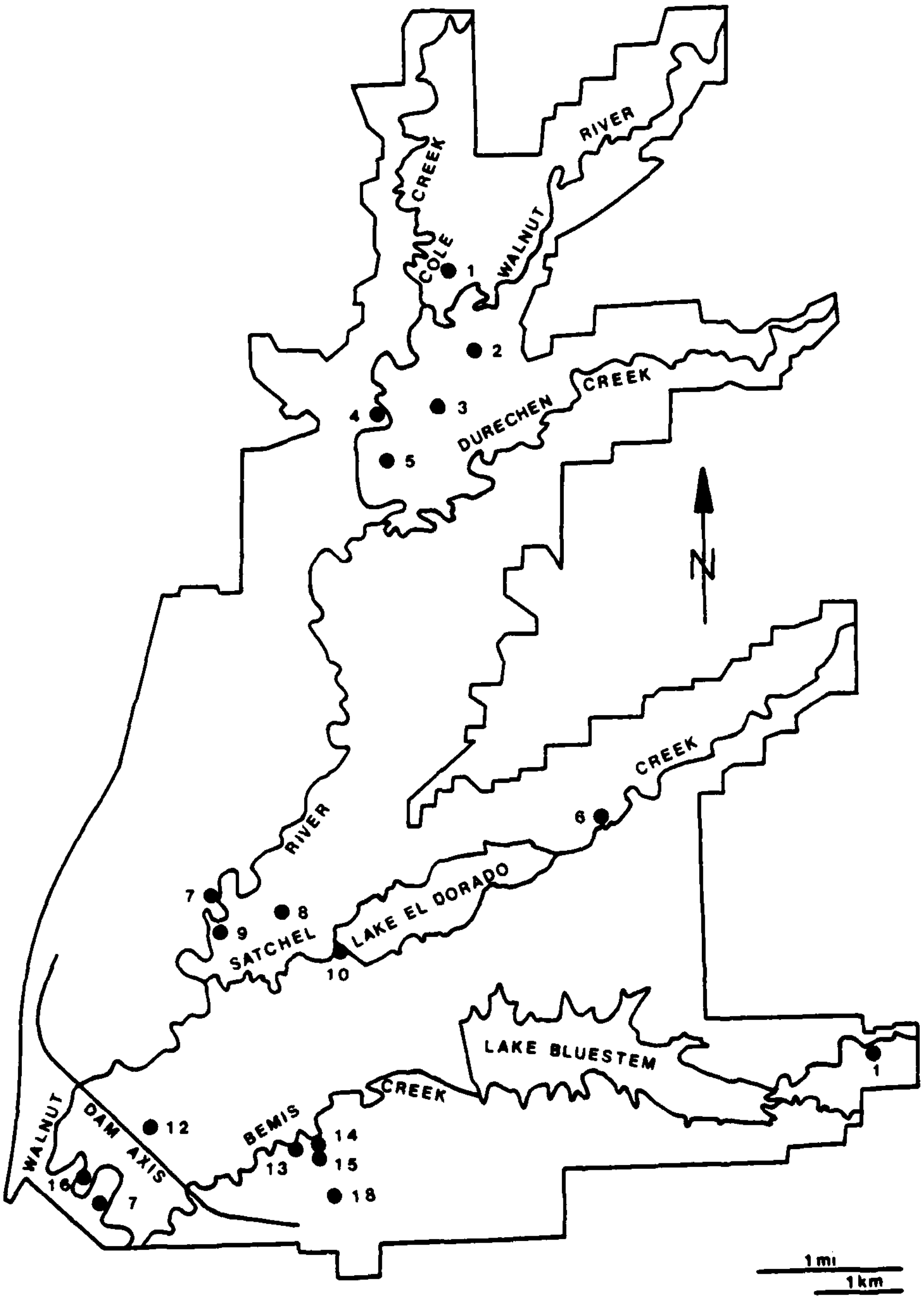

Figure 1.5. El Dorado Lake project reference locations; see Table 1.1 for legend.

Figure 1.4. Raging waters of Satchel Creek below Lake El Dorado spillway during the major flood of June 8, 1979, El Dorado Lake project; compare to Figure 1.11.

Figure 1.6. Kansas Geological Survey drill rig in operation, El Dorado Lake project.

Table 1.1. Legend for Figure 1.5.

1.	Freeway borrow pit; red alluvium removed and replaced by Holocene alluvium
2.	Underground pipeline trench
3.	Prominent T_1 terrace scarp
4.	Railroad alignment cut; charcoal site
5.	Archeological site 14BU81; backhoe trench
6.	Two minor cut terraces, floodplain, and T_1 terrace
7.	Archeological site 14BU9, Snyder site; backhoe trench; minor cut terrace; recent floodplain channel
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13.	Borrow pit bulldozer cut
14.	Borrow pit bulldozer cut; red alluvium removed and replaced by Holocene alluvium
15.	Borrow pit bulldozer cut
16.	Archeological site 14BU32; two backhoe trenches
17.	Two minor cut terraces
18.	Mandible site in colluvium

are in a bank of a diversion canal which diverts Bemis Creek away from the main construction zone to join the Walnut at a point above the dam. The canal parallels the dam for much of its extent, and it cuts across large sections of the floodplains of the Walnut River and Bemis Creek.

The other three borrow pit bulldozer cuts (Fig. 1.5, 13, 14, 15) were made southeast of Bemis Creek, within and adjacent to its valley (T25S, R6E, Sec. 29, NE¼SE¼SW¼; T25S, R6E, Sec. 29, SE¼SE¼SW¼; T25S, R6E, Sec. 29, SE¼SE¼SW¼). These cuts, plus other even deeper areas of the borrow pits corroborated and added to the observations made at the geological type site. In addition to the borrow pit sites, seven deep backhoe trenches were dug near archeological excavations; one just south of the Snyder site, 14BU9 (Fig. 1.5, 7); one at 14BU81 (Fig. 1.5, 5); three at 14BU4 (Fig. 1.5, 9); and two in the area of 14BU32 (Fig. 1.5, 16). All of these artificial cuts, plus construction company excavations for the new railroad alignment (T24S, R6E, Sec. 32, SE¼NE¼SE¼; Fig. 1.5, 4), an underground pipeline trench (T24S, R6E, Sec. 33, N½; Fig. 1.5, 2), and a freeway relocation borrow pit (T24S, R6E, Sec. 28, N½SW¼; Fig. 1.5, 1) provided the most useful available deep subsurface data in the field; other borrow pits widely scattered about the area, were of somewhat less value.

The new railroad alignment, which parallels the project area along much of its western boundary before traversing it north of Durechen Creek, is the one most extensive exposure in the entire area. It exposes an especially good cross section of the uplands. Most other upland evidence comes from the banks of a multitude of field ponds and larger reservoirs during periods of low water. By the end of summer, water levels drop to expose banks as much as a meter deep around the edges of Lake Bluestem and Lake El Dorado. The levels of the streams feeding the lakes (Bemis Creek and Satchel Creek, respectively) likewise lower to allow deeper views of their deposits. Borrow pits exist in the uplands, boat ramp construction has exposed two other areas, and drill hole records are available from many locations, both in the uplands and the valleys. Forty-one new drill holes were recently placed within the project area by the Kansas Geological Survey to supplement previous drilling records (Fig. 1.6). These were located mostly in an east-west direction transecting the central portion of the project area, where drilling information was lacking.

Additional information concerning character of the subsurface was obtained through the observation of distinct surface color differences. A reddish hue exists at the upland edges of the valleys and in the uplands, and other colors (generally grays) are present in the valleys nearer the streams. This is true throughout the project area, and has also been observed in other drainage systems of south-central Kansas. These color differences will be discussed at length.

Results of Investigations

Interpretative Problems and Limitations

Field work at El Dorado Lake has produced an abundance of positive

information. However, a number of gaps still exist due to the inability to recover certain crucial data. One of the major problems is that absolute dating of the deposits has not yet been accomplished. Other than a handful of known dates from relatively upper levels, in archeological sites (Leaf 1979:10), only one radiocarbon date has been obtained. That date came from a charcoal concentration at a depth of approximately 3 m. in a mixture of colluvium and alluvium beneath an old stream channel (Fig. 1.5, 4). This date (UGa-2716) is 1885 ± 65 B.P. (A.D. 65), and is much more recent than anticipated for this great depth. As it stands, the date has little value unless other dates are forthcoming to give it more context.

Bone material of a probable bison-sized mammal, including a badly crushed mandible, has been recovered from colluvium (Fig. 1.5, 18; Fig. 1.7; Fig. 1.8), but this find was too fragmentary to identify (Larry Martin, vertebrate paleontologist, University of Kansas, Museum of Natural History, personal communication, 1979). In addition, the University of Georgia radiocarbon laboratory reported that not enough bone was available for dating. Other than these bones and those found at archeological sites, only a few bones have been discovered in the project area. These were scattered, badly broken, and all within 1 m. of the surface in a disturbed area of a borrow pit (west of location 13, Fig. 1.5).

Chronology and paleoenvironmental reconstruction are further hampered by the unavailability of fossil pollen. Only a few possible pollen sites (i.e., filled basins) have been detected, and these do not appear to be very promising. Testing in the area produced no pollen (King 1979a).

The location of paleosols or other evidences of minor unconformities indicating short term occupation surfaces would be extremely useful in the compilation of the paleogeographic model. Although Mr. Harold Penner, of the U.S. Soil Conservation Service, who did soils work in the valley (U.S.D.A. 1975) believes that paleosols may exist in the stream alluvium at depths of about 75 and 125 cm. (personal communication, 1978), only one has thus far been discovered. It is approximately 50 cm. below the surface. Even stratigraphic sequences of archeological remains do not conform to any discernible levels or living surfaces, but rather exist as a vertical scatter (Gary Leaf, Museum of Anthropology, personal communication, 1979). This subject will be discussed in more detail.

A major goal of this research has been to locate buried Early Man sites. No such sites are known in Kansas, and their discovery would be highly significant. However, this search has been unsuccessful, and at this point, based on current concepts of the area and its geology, the chances of recovering human traces older than about 7500 years appear poor. The oldest known cultural materials in the area do not exceed 5000 years B.P. (Leaf 1979:10), and although the corresponding depth of excavation represents only one quarter of the total depth of the deposits present, it is not believed that these pre-5000 B.P. deposits are necessarily of great age, or that they are likely to produce Early Man evidence. Further, a large gap is believed to exist between the oldest of these deposits and the next older geologic unit found elsewhere in the area. If this is correct, then it follows that the deposits that could contain Early Man are missing from this area. This view is subject

Figure 1.7. An upland colluvial site containing mammal bones, El Dorado Lake project.

Figure 1.8. Closer view of bones in Figure 1.7, El Dorado Lake project; mandible of possible bison.

to revision should appropriate absolute dating be accomplished. More will be said about this when geological deposit relationships are discussed.

Problems in addition to those reviewed thus far were posed by the 1979 Walnut River flood. This major disaster, on June 8th, resulted from an 18-23 cm. rainfall within a seven hour period and caused the Walnut River to rise at least 9 m. This greatest of all recorded Walnut River floods covered vast areas of the valley, and yet the geologic implications were negligible. Observations made within hours of the withdrawal of the water indicated that both erosion and deposition were extremely minimal. The most detectable change was in a field above the flood which had undergone sheet-washing. This is difficult to understand, unless we are to classify this major flood of the present as a relatively very minor one in the history of the valley. How else can we account for 8-9 m. of alluvial deposition, with preceding erosion? One explanation might be that the water of this flood rose so rapidly within the channel that it simply did not pause long enough to erode into the banks anywhere before it overflowed their tops; then it receded equally fast, not remaining long enough at any one level to do any appreciable cutting. This rapidity of rise and fall would in turn retard deposition; i.e., the water retreated so quickly that small sediment grains did not have time to settle out. Undoubtedly, the heavily vegetated nature of both the banks and the floodplains also restricted erosion, and thus deposition. Yet, it is not easy to visualize prehistoric alluvial buildup in terms of this impressive flood, unless we are to believe that cutting and filling are in reality events to be correlated with abnormally large rains during generally dry periods when vegetative cover is less. This could well be the case.

Despite the many problems and informational gaps just discussed, much data of a positive nature have been gathered at El Dorado Lake. These relate to the establishment of the stratigraphy and the terrace system of the area. Basic sediment knowledge has also been obtained from field observations, and the validity of preliminary sediment interpretations is expected to be verified with completion of laboratory analyses. In the discussions to follow, all coded sediment colors are for fresh samples keyed to the Munsell Color Charts, 1975 edition.

Upland Sediments and Stratigraphy

Whereas valley sediments reach 8-10 m. in depth, the upland regolith is generally a comparatively thin veneer, ranging from literally nothing to 1.5-2.5 m. in places (Fig. 1.9). Many exposures have been observed within the project area, and over much of the eastern half of Kansas. The same materials appear to mantle the bedrock throughout this region. Based on drill hole information and visual inspection, this regolithic unit appears to exist primarily in lower parts of the uplands along and above drainages, and not thickly on tops and higher slopes. In all cases, there is a sharp break between bedrock and regolith. Weathered transitional zones between the two have not been detected.

The composite profile of upland regolith (Fig. 1.10) consists of a thin layer, 15-25 cm. thick, of broken limestone bedrock (D) above its parent material, overlain by up to 2 m. of a bright red (5YR 5/6) clay-silt (C),

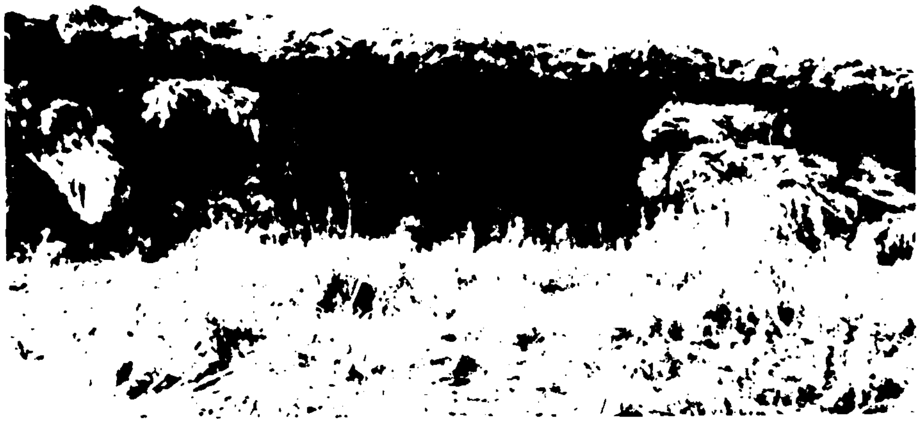

Figure 1.9. Typical upland natural exposure, El Dorado Lake project.

Figure 1.11. An upland valley sequence of limestone bedrock, gravels, and red alluvium mixed with colluvium; Satchel Creek below Lake El Dorado spillway, El Dorado Lake project.

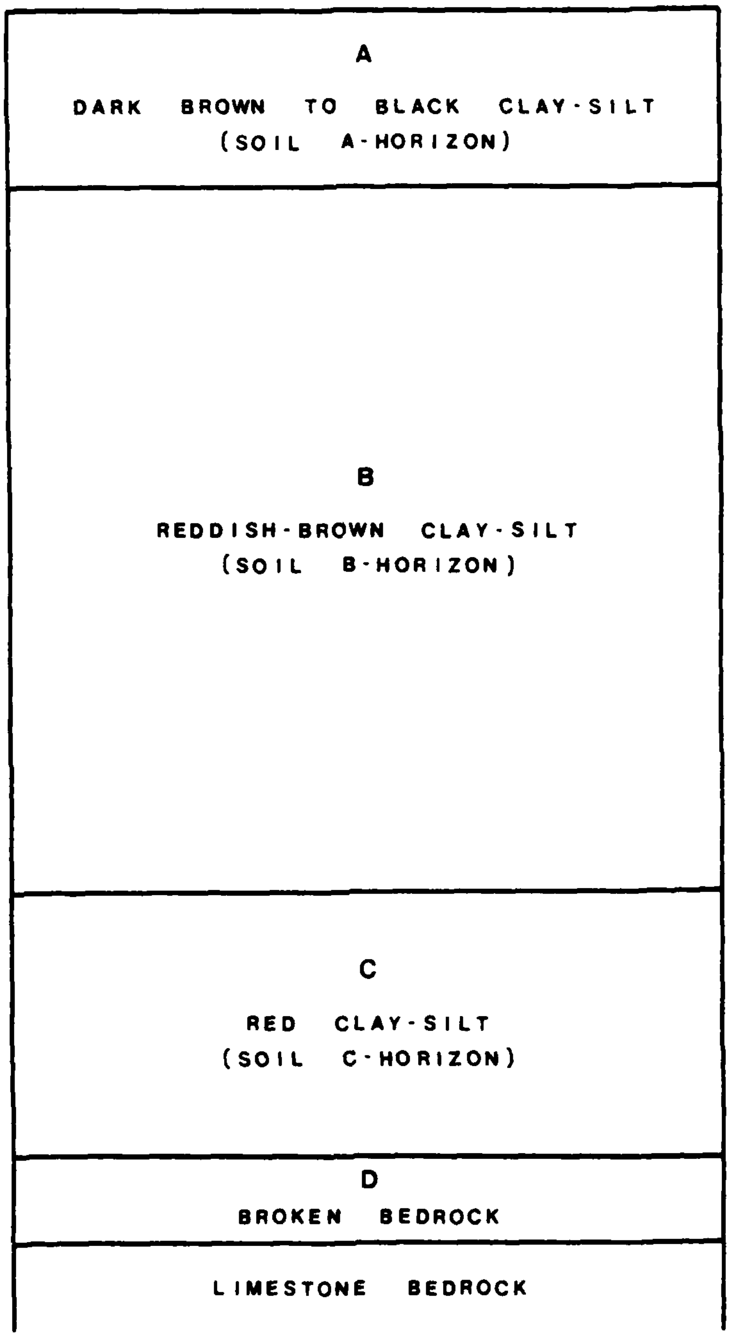

Figure 1.10. Generalized upland profile, El Dorado Lake project; no scale; see text for detailed unit descriptions.

then by up to 2 m. of a reddish-brown (5YR 3/4) clay-silt (B), and topped with 1-40 cm. of dark brown to black (5YR 3/2) clay-silt (A). There is a very sharp contact between Units C and D and a fairly clear break between Units A and B, but the transition from Unit B to Unit C is not well defined. The entire sequence is massive (unlayered), ungraded, fairly well sorted, and is composed mostly of silt-sized grains with interspersed clay. The silt is sub-angular quartz. There are no sedimentary structures or inclusions of large grains. Fresh exposures are fairly soft, whereas dried material becomes brick-hard. It is believed that Units A, B, and C are actually one geologic unit differentiated by weathering, i.e., by soil development. That is, Units A, B, and C are seen to be soil horizons of a single regolithic unit.

Origin of the Upland Regolith

There are two possibilities for the origin of the upland regolith; one depositional and one non-depositional. The latter implies residual weathering of the bedrock under a widespread climatic regime over a long period of time. Limestone is known to alter to a red color with appropriate climatic conditions. However, acid testing in many places indicates that the regolith is not at all calcareous, as one might expect if the parent material were limestone. On the other hand, it is possible that, given enough time, all traces of the parent material have leached out of the weathering profiles. Limestone has a tendency to dissolve away totally, leaving behind no calcareous grains. But many things are left unexplained, especially the high percentage of silt-sized sub-angular quartz grains found in the overlying material. Quartz does not appear to be a locally derived mineral; the average limestone contains less than 5% quartz. Limestones are mostly composed of small marine organisms and/or organic materials, and the organisms are types which cannot live in environments containing much coarse clastic material, such as quartz, because they are choked by it. Further, if much quartz is present, it quickly abrades the much softer carbonates to dust, which in turn dissolves and is carried away (Blatt, Middleton, and Murray 1972).

In order to resolve somewhat this issue, two samples of limestone from two different formations were dissolved in hydrochloric acid to determine the quartz content. The carbonates go into solution and leave behind a residue of non-soluable materials. Both samples came from locations immediately beneath the regolith. The first sample of 432 gm. produced a small amount of very fine clay and only a trace of silt-sized grains, which were probably quartz because they survived the acid. There was not enough of the silt to collect, weigh, and study. This experiment indicates that it is highly improbable that the regolith could have formed from the weathering of this limestone because of the extremely small quartz content of its small grain size. With a silt size as a starting point, it is likely that long term weathering would have reduced it to clay size.

The second sample, weighing 441 gm., contained about the same amount of clay as the first sample, but it also produced 9.5-10.0 gm. of quartz (about 2.2%). This is replacement quartz which had transformed calcareous fossil shells into silicified shells. Thus the grain size is equivalent to the original size of each shell, the larger ones of which are 2 cm. in length. However, it is the thickness of these, not the length, which determines the size of the daughter grains. Their thickness is somewhat greater than silt

size, reaching into the finer sand categories. Conceivably then, this limestone could be parent to the regolith, given enough limestone and time; with the age of the rock being 230-280 million years, there would certainly seem to be enough of the latter. But again, it does not seem probable, considering the small amount of quartz and the small size of the daughter grains it would likely produce.

There are two possibilities for the depositional origin of the regolith. One is that it could have been deposited in a large body of water, and the other is that it could have been deposited by wind as loess. There is no evidence (fossils, sedimentary structures, ancient shore lines, etc.) pointing to water deposition. The unit is also believed to be much too recent to have been related to any known water body of the size required for such an extensive deposit.

In the author's opinion, the evidence at hand rather strongly indicates that the upland regolith is a blanket deposit of eolian loess. This is suggested by several lines of evidence:

(1) the suspected widespread distribution of the material over most of the eastern half of Kansas;

(2) at least two different underlying bedrock types (the author has observed regolith, believed to be the same, overlying sandstone bedrock in the vicinity of Kanopolis Reservoir in central Kansas);

(3) the relatively thin nature of the unit on upper slopes and tops as opposed to lower more sheltered areas, as would be expected with eolian deposition;

(4) the sharp contact between bedrock and regolith with no observed transitional weathering zone;

(5) lack of bedding;

(6) no observed large grains or inclusions;

(7) quartz grains with no convincing local source;

(8) no acid reaction of regolithic material;

(9) predominance of silt-sized grains;

(10) angularity of grains;

(11) grains fairly well sorted.

It is beyond the scope of this research to carry the argument further. It cannot be resolved without absolute dates, detailed sediment studies, and an extensive and widespread field orientation. For purposes here, however, the regolith will be assumed to be red loess.

Upland to Valley Transition Zone

As should be expected, the materials bordering the valley troughs consist of a mixture of gravity deposits (brought down as colluvium from the uplands) and stream deposited alluvium (Fig. 1.11). This is an area of relative complexity where deposition can be quite rapid, as is attested by the previously mentioned radiocarbon date of 1885 B.P. at a depth of 3 m. The juncture of the Walnut River Valley with the uplands is rather abrupt, with local relief commonly 10 m. or more. This abruptness is responsible for the dominance of the red upland materials in this zone. Although the horizontal extent of the zone is unknown, its existence has been verified at several locations by the presence of mixed materials, including clay, silt, and several sizes of gravel. Matrix materials, generally of silt and clay, exhibit a wide range of colors from browns, reds, and tans to grays and blacks. Often the gravels occur in lenses indicating sequences of gravity deposition, especially in more upland locations (Fig. 1.12). The mandible and related bones mentioned earlier (Figs. 1.7 and 1.8) came from a colluvial deposit of reddish-brown silts mixed with both large and small gravels, and if a date had been obtained it is unlikely that it would have been a true guide to the age of its matrix.

Valley Sediments and Stratigraphy

Much of the valley sequences was derived from the bulldozer cut at the type site (Fig. 1.5, 12; Figs. 1.13, 1.14, and 1.15), although it too is a composite of observations made at many locations (see Fig. 1.16). Resting on bedrock are channel gravels (E) consisting of limestone and chert, for the most part. There are two distinct kinds of chert; one is gray in color and the other a dark tan to brown. This deposit ranges in thickness from a thin veneer to as much as 1.5 m. Above the gravel is a brightly colored (5YR 5/6) red alluvium (D) which reaches thicknesses of 8-10 m. in places. It is massive, ungraded, fairly well sorted, and is composed of mostly silt-sized grains with some clay. The silt is sub-angular quartz. There are no sedimentary structures. Fresh exposures are fairly soft, whereas the dried material becomes brick-hard. This unit is identical to upland Unit C with these exceptions: (1) it is much thicker; (2) widely scattered small gravel exists as inclusions; (3) there are many rootlet casts; and (4) iron staining is present. Like the upland red loess, there is no acid reaction, except with the gravel inclusions. Samples of both materials, when dried, lost their bright red color and look essentially the same. They appear to be lithological equivalents, and a definite relationship seems to exist between the upland and valley red units.

A major erosional surface exists at the top of the red unit. This episode cut the paleochannels, which were later filled with a light gray to white (10YR 7/1) deposit (C) to an unknown depth (Fig. 1.15). About 1-1.5 m. of Unit C remain, but a second erosional period followed which stripped off the tops of the channels and more of the red deposit. Within the faced paleochannel appear structures that may represent a dried surface, and thus a minor unconformity. This is shown by the dashed line in Figure 1.15. This unit seems to be almost entirely made up of clear silt-sized sub-angular quartz grains, with little or no clay. It is massive with no apparent significant grading, except that small gravel exists at the bottom. Iron staining

Figure 1.12. An upland colluvial site, El Dorado Lake project; note interspersed gravels.

Figure 1.13. Valley geological type site prior to bulldozing, El Dorado Lake project; note paleochannel.

Figure 1.14. Valley geological type site after bulldozing, El Dorado Lake project.

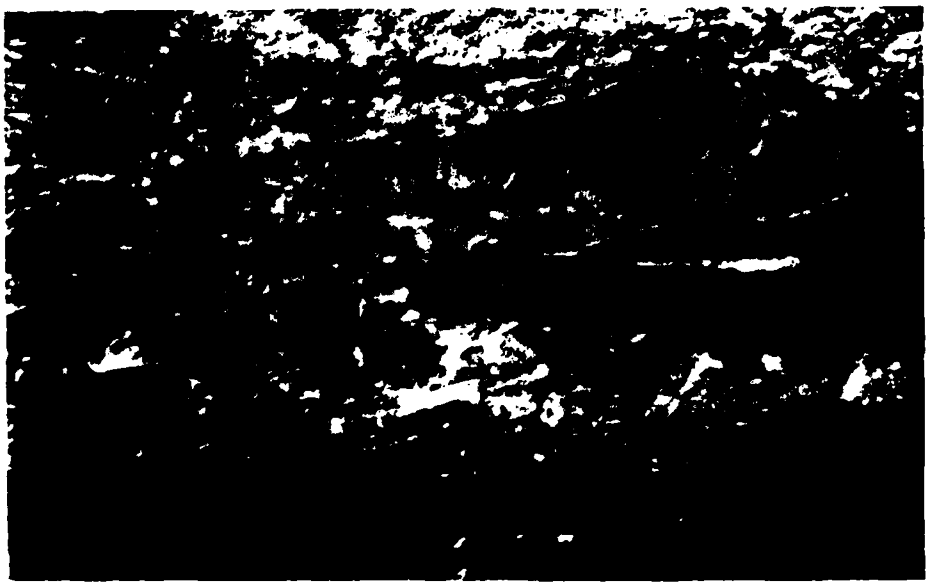

Figure 1.15. Valley geological type site; close view of paleochannel incised into red alluvium.

and rootlet casts are present. This unit is extremely soft, and may be cut quite easily with a trowel. In general, it appears to be the same as the lower red unit without the red color.

From the erosional surface to the top of the profile is a typically gray unit (B + A) which reaches 8-9 m. in thickness, and which is undoubtedly alluvial in origin. This "upper alluvium" in places may also be dark brown or tan in color. The uppermost part (A) is the modern soil A-horizon. The total unit (B + A) typically ranges from a gray color (5Y 6/1) at the bottom to a darker gray to black (10YR 3/1) at the top. It appears to be a nearly homogeneous and regularly deposited massive unit with no clearly apparent breaks. It contains high percentages of clay, and is extremely difficult to cut with a trowel, even when fresh. The lower portion has iron staining and rootlet casts, and the A-horizon contains roots, small sporadic nodules, moderate to strong structure, and is typically .5-1 m. in thickness. These units sometimes react slightly to acid.

Floodplain and Terraces

For purposes of this paper and this area, a floodplain is hereby defined as the broad flat surface usually adjacent on both sides of a stream that is ever subject to flooding and alluvial deposition. It must be at least equal in elevation to the highest alluvial level of the current valley cut and fill sequence. Thus, most of the width of the Walnut River Valley trough (to 1200 m.) is considered to be floodplain, and is designated T_0.

Terraces, as here defined, are of two types: (1) cut terraces and (2) cut and fill terraces (or simply "fill terraces"). Cut terraces may be either major, in which large portions of alluvium are removed, or minor in which only small amounts are eroded. The latter are those minor steps notched into the sides of banks during one high water episode (or at most a few), in which the water remains at a fairly constant level for a time (water is not likely to notch if it moves rapidly up or down). Cutting episodes only cut; they are not followed by filling with replacement sediments. Thus, the notch is made and remains a notch. Fill terraces, on the other hand, are major terraces created by a major removal of alluvium followed by a significant refilling of this emptied area by more recent alluvium. Fill terraces and major cut terraces are considered significant enough temporally to be given number status and are numbered consecutively upwards from the floodplain (T_0), whereas minor cut terraces are considered to be only minor constituents of the floodplain itself, and do not warrant numbers.

As mentioned, the maximum depth of the valley deposits to bedrock is about 8-10 m. For the most part, the Walnut River in this area is entrenched in alluvium about 5-7 m., and flows on bedrock. Some gravel exists in places on the bed. The presence of only this type of sediment in the main channel indicates a high level of stream competence, at least periodically, which carries away the finer materials and leaves only the coarser ones. With the bedrock reached, vertical cutting is now greatly hampered. Frequent flooding and high discharge are indicated by the thick alluvial deposits and the broad floodplain. Relative stability of the main channel and its major tributaries over the past 1000 years, however, is suggested by the

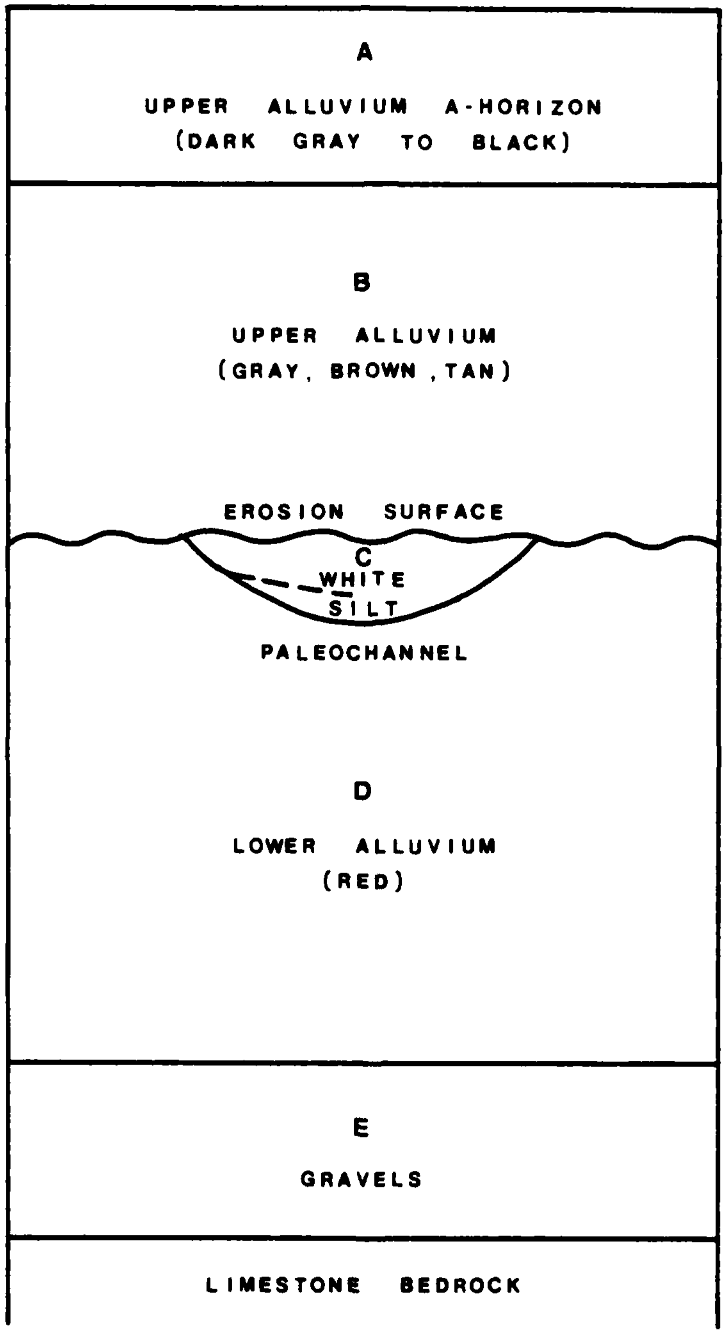

Figure 1.16. Generalized upper Walnut River Valley profile, El Dorado Lake project; no scale; see text for detailed unit descriptions.

abundance of archeological sites of that period fairly close to present banks (Root 1979:40). On the other hand, some lateral cutting is indicated by the presence of a few relatively recent, discontinuous, minor cut terraces in various places. One of these exists along the west bank of the Walnut River east of the Snyder site, 14BU9 (Fig. 1.5, 7), where the stream has eroded out an area westward into the top of the alluvium. Between this notch and the site is a shallow recent floodplain channel which bisects the minor cut terrace surface. This channel carries water only intermittently, during floods and when runoff from the uplands is higher than usual.

Another minor cut terrace is located just to the south of the Snyder site along the east bank of the river in the vicinity of archeological site 14BU4 (Fig. 1.5, 9). These two may be contemporaneous and be related in a presently unknown way to the Vanoss soil series (U.S.D.A. 1975).

Two minor cut terraces were noted on the north side of Satchel Creek at the east end of Lake El Dorado (T25S, R6E, Sec. 15, NE¼SW¼; Fig. 1.5, 6). There is no high stream bank here; the uplands merely slope down to a very low bank. The lowest of these terraces is about 1 m. above the stream bed, the second is about 2 m. above it, and the edge of the T_0 floodplain about 4 m. above it (Fig. 1.17). At least two others exist in the high west bank of the Walnut River south of the new dam (T25S, R6E, Sec. 31, SW¼NW¼; Fig. 1.5, 17), and at least one other is known along Bemis Creek south of the government reservation (T25S, R6E, Sec. 31, SE¼SE¼).

The word "terrace" is almost a misnomer as far as fill terraces are concerned in the upper Walnut River Valley. Harold Penner (personal communication, 1978), who has spent a great deal of time in the valley conducting soil surveys, said that terraces throughout Butler County are very difficult to detect. Actual fill terrace scarps have been observed in only two locations in the project area (T24S, R6E, Sec. 33, SW¼; Fig. 1.5, 3 and T25S, R6E, Sec. 20, NW¼; Fig. 1.5, 8), and these are both of the same terrace. Both are about 3 m. higher than adjacent alluvium and about 8.5-9 m. above the river bed. The northernmost (farthest upstream) is higher in elevation (by about 6 m.) as is to be expected and seems to be a bedrock controlled feature, whereas the other is not. Apparently alluviation and/or erosion has smoothed out the landscape, except in these two places, obliterating all other traces of scarps.

Other evidence points to this terrace as being a fill terrace, and the only one in this part of the drainage basin. Apparently only remnants of it survive, and these are subtle. The general configuration of these remnants and of the terraces they represent, has been traced through several lines of evidence. Other than the scarps, surface information consists of horizontal color differences, as noted earlier. The valley edges, in many places, appear dark red, as opposed to the grays, browns, and tans found nearer the streams (Fig. 1.18). Subsurface data indicate that these red areas are indeed the remains of a cut and fill terrace carved from the red alluvium (Fig. 1.19). Stratigraphic relations (see Fig. 1.15) show that the red alluvium is beneath the more recent (gray, brown, and tan) alluvium, and that a major unconformity exists between the two units. Further, geomorphic relations show that the red unit has been deeply eroded away and replaced by the later alluvium horizontally. About 60 m. west of the geologic type site (Fig. 1.5, 12) a clear

Figure 1.17. Minor cut terraces along Satchel Creek at east end of Lake El Dorado, El Dorado Lake project; the tree limbs are on the lower terrace, the foreground standing trees are on the second terrace, and the truck is on the floodplain.

Figure 1.18. View of red terrace (at horizon) above the floodplain of Satchel Creek at the east end of Lake El Dorado, El Dorado Lake project; photo taken from near the truck in Figure 1.17.

Figure 1.19. View of red terrace (in distance) topographically above Holocene alluvium (foreground) in a borrow pit along the Walnut River northeast of the Cole Creek junction, El Dorado Lake project.

Figure 1.20. Contact zone of red alluvium (right) and gray alluvium (left), El Dorado Lake project; the older red unit has been removed by erosion and replaced by the Holocene deposit.

break occurs between the two (Fig. 1.20), with the gray extending all the way to the Walnut River about 1 km. away. At another borrow pit site (Fig. 1.5, 14) the same situation exists along Bemis Creek, where the red has been cut out and replaced by the gray. The same thing may also be observed just below the Lake El Dorado spillway (T25S, R6E, Sec. 20, SW¼SW¼NE¼; Fig. 1.5, 10), and far to the north along the Cole Creek (Fig. 1.5, 1).

The Kansas Geological Survey drilling operations in the valley were partly for the purpose of clarifying the terrace situation. These drill holes helped to enhance the terrace interpretation by delineating horizontal boundaries between the older and younger alluvia, by indicating terrace relations to bedrock, and by helping define the degree to which the underlying red alluvium had been stripped from the valley.

Mr. Penner (U.S.D.A. Soil Conservation Service, personal communication, 1978) correlates the red and gray units with two distinct soil types: the red with the Norge series, and the gray mainly with the Verdigris silt loam (U.S.D.A. 1975). He further states that the Norge series is probably on an old terrace, while the Verdigris silt loam is probably developed on recent alluvium. Kansas Geological Survey drilling and other field work indicate that he is correct, and that these soil units as depicted on the U.S.D.A. maps can be used as a reasonable basis for mapping the red terrace remnants (hereby designated as the T_1 terrace) and the recent alluvium. The results of this may be seen in Figure 1.21.

Summary and Discussion of Field Results

Summary of Major Geological Relations

An outline of the major prehistoric events of the area is now possible, although dates are as yet almost entirely relative due to the paucity of absolute dates, as discussed earlier. Time control is only minimally available for the past 4800 years, and the uppermost 2.5 m. of the deposits (Leaf 1979:10). Figures 1.22 and 1.23 depict the relationships as they are currently understood. The inferred dates in Figure 1.22 will be discussed later.

At an unknown time in the past, the slate seems to have been wiped clean with the removal of the regolith (except perhaps for the gravels) from the bedrock, both in the uplands and in the valleys of the area (Fig. 1.22, A). This is difficult to visualize, but it is the record available, and all new regolithic buildup must ultimately start with bare bedrock somewhere. The denudation may have been related to the runoff of Pleistocene glacial meltwater, perhaps in association with the high winds often attributed to glacial and periglacial environments. Next, red loess was widely deposited (Fig. 1.22, B, 2) and this too may be related to glacial and/or slightly post-glacial conditions.

As the loess was being deposited, it was being carried down upland slopes to produce colluvium (Fig. 1.22, B, 3) along valley edges and source material for alluvium in the valleys. The red alluvium (Fig. 1.22, B, 4) built up to a depth of 9-10 m., and rested on top of the coarse gravels that may have been left behind during the earlier denudation event. Then a major

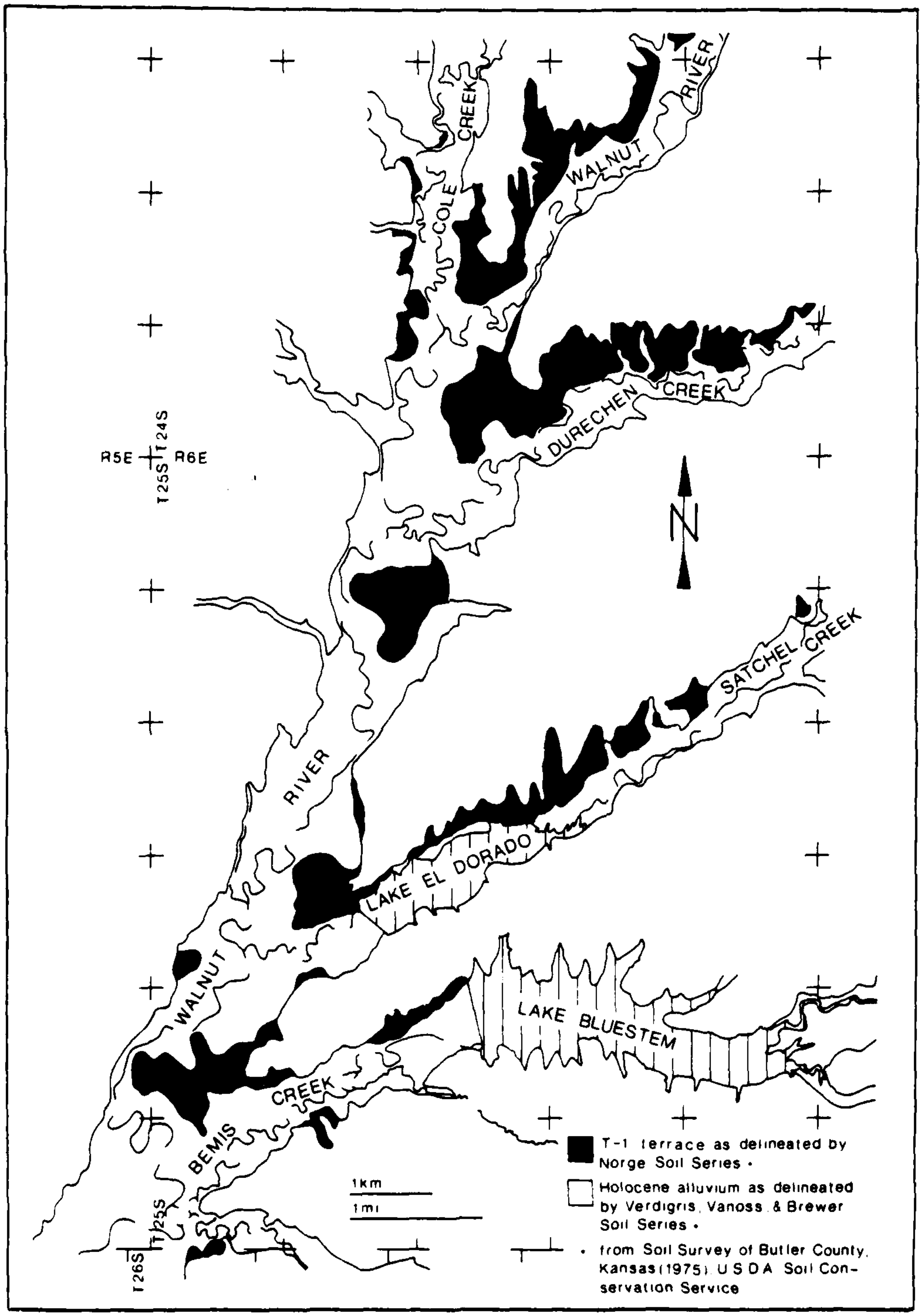

Figure 1.21. Red terrace (T_1) remmants and Holocene alluvium as mapped by soil types, El Dorado Lake project.

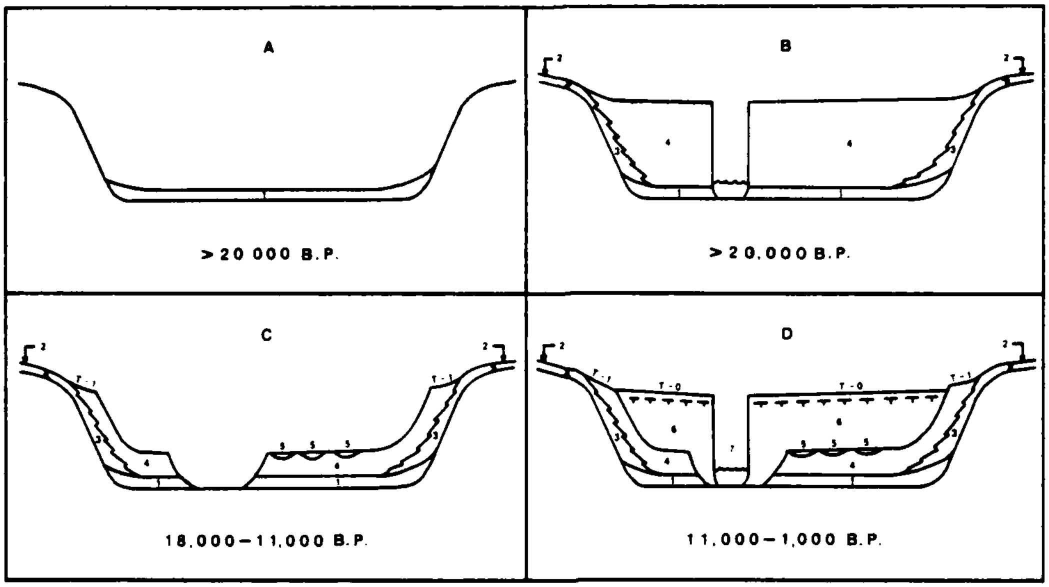

Figure 1.22. Geological history of the upper Walnut River Valley, Kansas, El Dorado Lake project; see Figure 1.23 for the present stage and unit designations; see text for descriptive data.

period of erosion ensued which stripped out much of the red alluvium from the valleys; left a high, red, major cut terrace; and cut several channels in the alluvium, which in turn became filled with sediments (Fig. 1.22, C, 4, T_1, 5). This was followed by a relatively minor episode of erosion in which the tops of the channels and adjacent areas of red alluvium were shaved off. Then began a period of valley filling, which has lasted almost to the present, in which the upper alluvium has accumulated to a level almost identical to that of the earlier red alluvium (Fig. 1.22, D, 6). This episode transformed the T_1 terrace into a fill terrace. Near surface dates indicate that alluviation has either ceased over the past few years, or that erosion has removed some of the surface. This cycle of deposition was significantly interrupted at least one other time, as attested by the presence of a paleosol approximately 50 cm. below the surface. Recently, minor cut terraces were notched into high banks (Fig. 1.23, 8), a network of shallow channels etched the floodplain surface (Fig. 1.5, 7, 11), and the modern soil developed on the floodplain (Fig. 1.23).

A summary of the relative age relations of the deposits, from oldest to most recent, looks like this: (1) bedrock, (2) valley gravels, (3) upland red loess, (4) valley red alluvium, (5) valley paleochannel sediments, (6) valley upper alluvium. Colluvial deposits may fit into the sequence at several points beginning with (3).

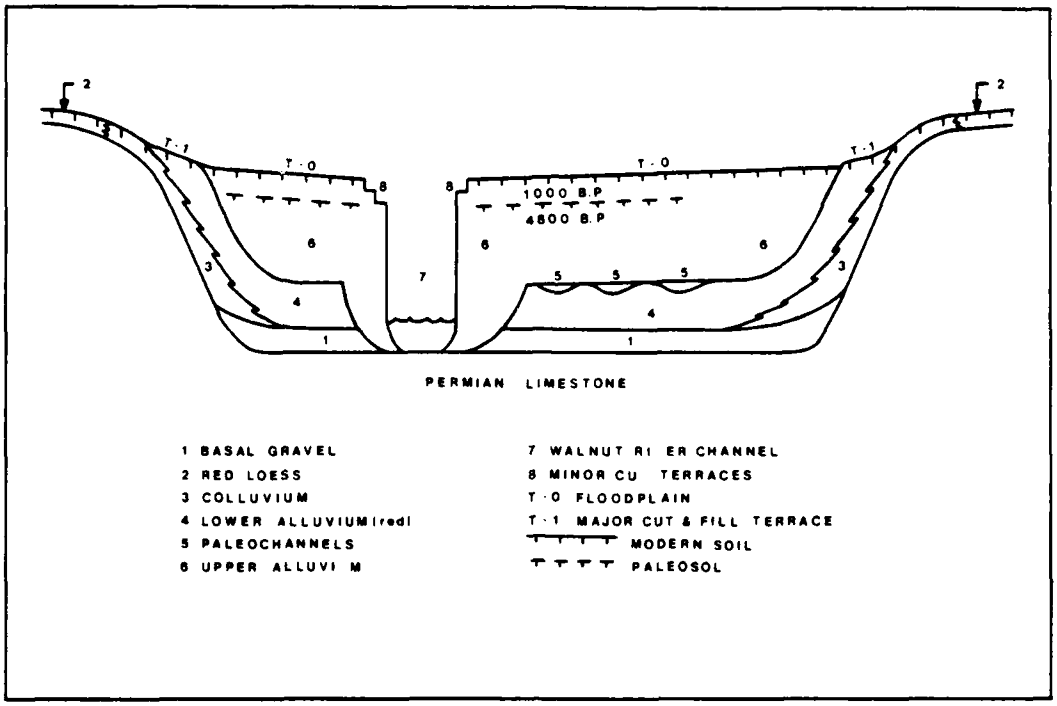

Figure 1.23. Composite cross section of the present upper Walnut River Valley, Kansas, El Dorado Lake project; no scale.

A few words of speculation concerning an absolute time frame may be of use as a working hypothesis (see Figs. 1.22 and 1.23). The only time controls available are dates from archeological sites in the upper 2.5 m. of the upper alluvium, plus the known distribution of artifactual materials throughout the area. All such materials are related entirely to the surface or upper subsurface of the upper alluvium, or to the surfaces of the red terrace, the colluvium, and the red loess. This suggests that the red loess and red alluvium are pre-man in this area, i.e., that they are at least several thousand years old. Further, the red loess is strongly weathered, indicating that it has been there quite some time; and the more recent red alluvium, is deeply buried and extensively eroded, and thus seemingly also quite old. In the author's opinion, both of these units probably exceed 20,000 years in age. It is possible that the removal of the red alluvium may be related to the large runoff of glacial meltwater which began about 18,000 B.P. when the Wisconsinan Stage reached its peak.

The upper alluvium acquired the upper quarter of its deposits over the past 5000 years. That does not mean, however, that the lower three quarters represent another 15,000 years. To extrapolate sedimentation rates is a very risky business with dubious rewards, unless several reliable dates bracketing the profile of concern are available. Even then there is no guarantee of success. It can be assumed that alluviation at the beginning of a fill cycle will be much more rapid because the banks are lower and more easily overcome then. As the floodplain builds up and the banks become

higher relative to the channel, only extraordinary floods will be able to add to the growing column of alluvium. With this reasoning, and allowing for a reasonable period for the removal of the red alluvium, which began at the postulated 18,000 B.P. date, a beginning date of 12,000-10,000 B.P. would not seem to be out of line for the upper alluvium; and this, of course, fits in nicely with the widely accepted end of the Pleistocene.

If any of this is at all valid, and the red loess is as widespread as cursory investigation suggests, the implications for archeology in this region could be significant. What this means is that, if the red loess was deposited before man's arrival, there is predictive value as to where buried sites may or may not be found within a vast area. It suggests that the only buried sites to be found in this region will be either in secondary deposits in small upland basins or in valley deposits. This could also help to partly explain why Early Man sites are not known in eastern Kansas. Perhaps the appropriate deposits simply do not exist, because they never accumulated in the uplands, and they have been flushed out of the valleys or are too deeply buried for access.

Upper Alluvial Subdivision (Horizontal)

Several variations in colors have been noted for the alluvium in different parts of the valley. Vertically, color differences within units may be attributed to weathering and soil horizon development, but the major color change between the red alluvium and the upper alluvium with its grays, browns, and tans is not so easily explained. One explanation is that the red alluvium is red because it was derived quickly from the newly deposited red loess before the loess had undergone much of the weathering that it was to undergo (actually some of the red alluvium could itself be primary loess). Then, by the time the upper alluvium was deposited, the upland red loess had weathered significantly to produce darker source materials, which came into the valleys in a variety of reds, blacks, grays, and browns, with the result that this unit looks distinctly different. Another explanation is that the color differences may reflect changing climatic conditions, with the upland red loess (the parent of the red alluvium) having become red in a cooler and wetter regime, whereas the upper alluvium may indicate a later, warmer, and drier environment. This, of course, would reflect two significantly different events of in situ color development caused by differing weathering conditions. It is generally believed, and widely accepted, that glacial times were cooler and wetter than post-glacial times, and there seems little doubt that the red alluvium and upper alluvium correlate respectively with pre-Holocene and Holocene times.

Horizontally, lighter colors (such as tans and light grays) tend to be closer to the channel, and darker ones (such as dark grays and dark browns) tend to be farther from it. These differences may be due to specific depositional areas, to varying water holding capacities of various sediments, and consequently to the abundance of vegetation that will grow on them. That is, natural levee deposits closer to the channel are somewhat coarser, hold less water, support less vegetation, and are somewhat higher than deposits beyond them; they will produce lighter colored sediments. The sediments farther from the river will be finer and lower, will hold water longer, will support more vegetation, and will, thus, be darker in color (Collinson 1978).

The underlying red alluvium, however, does not show these variations, and this may be related to the fragmentary nature of this unit, since it apparently has been completely removed from areas nearer the river. Further, the upper levels of this unit (where it does exist) have been removed, except along the valley edges where, indeed, a darkening to a reddish-brown color has occurred on the terrace. This darkening, however, is more likely related, not to overbank conditions as just outlined, but rather to long time weathering of exposed surfaces as they blend in with the uplands.

It is true, as well, that in cases where the alluvium is a dark brown color, that the color is a reflection of a close affinity to a probably more direct upland source area. That is, dark brown alluvium probably is the result of a shorter distance of transport from the ultimate upland source of red to reddish-brown materials, whereas a lighter colored alluvium may be related to greater transport distances and more re-working of the source materials. Indeed, since the upper Walnut River basin is completely surrounded by uplands covered by red to reddish-brown materials, any alluvium not of those colors may indicate a great deal of re-working and winnowing of those fractions responsible for the colors and/or great modification by weathering processes and by the vegetational component.

Thus, in summary, alluvial color differences may be due to: (1) depositional environment, (2) source area characteristics, (3) distance of transport, (4) the number of re-workings, (5) the degree of weathering, (6) time, (7) man's influence, or (8) a combination of several of these factors. Each specific example must be judged on its own set of circumstances. The red alluvium, for example, is not likely to have been transported far, to have taken long to accumulate, or to have undergone much alteration from its parent material, and this is strongly suggested by comparisons of samples from the two areas, which are identical for all practical purposes.

Upper Alluvial Subdivision (Vertical)

There are a number of clues that can aid in the vertical subdivision of a sedimentary body. All of these, in one way or another, point to breaks or changes in the sequence which stand out to separate events. Some of these are clear and easy to see, and others are quite subtle. A list of these markers includes:

(1) cultural materials and living surfaces

(2) unconformities (breaks in sedimentation)

  a. erosion surfaces

  b. paleosols

(3) absolute dates

(4) color changes

(5) pollen fluctuations

(6) fossil inclusions and type changes

(7) sedimentary structures and features (buried terraces, paleochannels, crossbedding, etc.)

(8) sediment grain size and/or composition changes

(9) sedimentary bedding and laminations

In most cases, no one of these is sufficient to provide enough information for subdivision. Indeed, the more the better. Dates, for example, separate a span of sediments, but if nothing else is found with or between them, nothing has been delineated except a column of sediments. The presence of a paleosol tells you no more than the existence of a gap in sedimentation. But dates on each side of the paleosol tell you a great deal about the magnitude of the break. If artifacts are found on the surface of this dated paleosol, then a picture has begun to emerge.

Many problems exist in the project area which make any really detailed subdivision of the upper alluvium difficult. Accessibility to the total unit is one of these problems, especially in places where it is probable that more than one of the indicators is present. The archeological sites are more likely to produce several markers; however, almost all of these sites are extremely limited by their shallowness. Backhoe trenches near sites have given a bigger picture, and drill holes to bedrock have added still more information. But even these have not produced much conclusive evidence to aid in the subdivision.

In general, the upper alluvium appears to be a consistently deposited unit, over several thousands of years, which contains few indications of internal change. Materials appear the same from bottom to top, bedding is so subtle as to be essentially undetectable, sedimentary structures are rare and are not found with other indicators, fossils are found only in archeological contexts, no pollen has been found, color changes are not sharp in almost all instances, absolute dates are restricted to the past 4800 years, only one paleosol has been detected, no erosion surfaces have been verified except perhaps one overlying the paleosol, cultural materials have been found only in the upper 2.5 m., and sediment grain size changes are negligible. Results of 94 sediment particle size analyses taken at 10 cm. intervals, ranging from the surface to 2.3 m. at six archeological sites throughout the valley, indicate no significant grain size changes that can be applied to any subdivision of the alluvium. Drill holes to bedrock have suggested, as well, that there indeed is no significant change throughout the 8-9 m. of this unit. The only known subdivisional indicators have been discovered at archeological sites, with dates ranging from about 700-4800 B.P. (Leaf 1979:10). In addition to the dates themselves, artifactual and bone materials have been recovered, and one paleosol is known to exist. The top of the paleosol appears to be truncated by an erosional surface, and the top of the remaining portion is overlain by an orange B-horizon of the soil above. This paleosol is known from two sites, 14BU4 (Fig. 1.5, 9) and 14BU9, Snyder site (Fig. 1.5, 7), which are on opposite sides of the Walnut River. At the former, there is an approximate 25-30 cm. A-horizon containing Woodland period materials, another 25-30 cm. of the orange B-horizon containing no artifacts,

and then the paleosol which contains Archaic materials (Joe Artz, Museum of Anthropology, personal communication, 1979). At the Snyder site, these same relations occur, except that the soil horizons and the paleosol are not as well developed. The paleosol would seem to separate the Archaic and Woodland cultures, and its top appears to date about 2000 B.P., with a cultural gap of about 1000 years above it. At Snyder, cultural debris exists fairly continuously from about 50 cm. down to 140 cm. (the extent of recent excavation); this 50-140 cm. range is considered to be entirely within the paleosol (Gary Leaf, personal communication, 1979). All these relations are depicted in Figure 1.24.

To further complicate the subdivision problem, the upper sediments at Snyder are greatly disturbed by modern agriculture, bioturbation is suspected throughout the column (and in the alluvium of the valley in general), and none of the several archeological dates can be related to any actual prehistoric natural surface. There is simply a vertical scatter of cultural debris and bones throughout the column, with more at some depths than others (Gary Leaf, Museum of Anthropology, personal communication, 1979). None of the other known sites would seem to have the potential to be nearly as useful as Snyder for subdividing the upper alluvium, and it does not appear probable that this site can provide sufficient data itself. In the author's opinion, human occupation on the floodplain was sporadic and temporary, because the valley has long been subjected to frequent and major flooding. Therefore, one cannot expect that many actual cultural levels would have formed. The floodplain may have been occupied only seasonally, with retreat to the valley slopes and the uplands the rule.

Sources of Human Mineral Resources

Little precise data have been collected on this subject, except for extensive research conducted by Haury (1979) and Chapter 2, this volume, on the possibilities of chert locations. Water would not seem to have been too major a problem for aboriginal inhabitants of the area, if extrapolations may be made from present conditions. Even during the dry summer of 1978, the Walnut River and its major tributaries carried some water. In addition, many springs are known to exist in the area, some of which are perennial (Butler County, Kansas 1887; Fath 1921; Leonard 1972; Bob Holmes, El Dorado, Kansas resident, personal communication, 1978). It is likely that ponded depressions, especially oxbows, have also provided water from time to time. Clay for making pottery is greatly abundant in the alluvial deposits throughout the area, having been derived from erosion of shales and the weathering of limestones (Fath 1921). Sandstone is not known from the area, and the nearest sources may be 80-120 km. to the northwest and/or southeast (Gary Koontz, personal communication, 1978). However, a sandstone metate was excavated from the Two Deer site (14BU55) in 1978 (see Adair and Brown, Chapter 5, this volume).

Relations to Other Studies

Introduction

It would be of interest to be able to compare the results of these

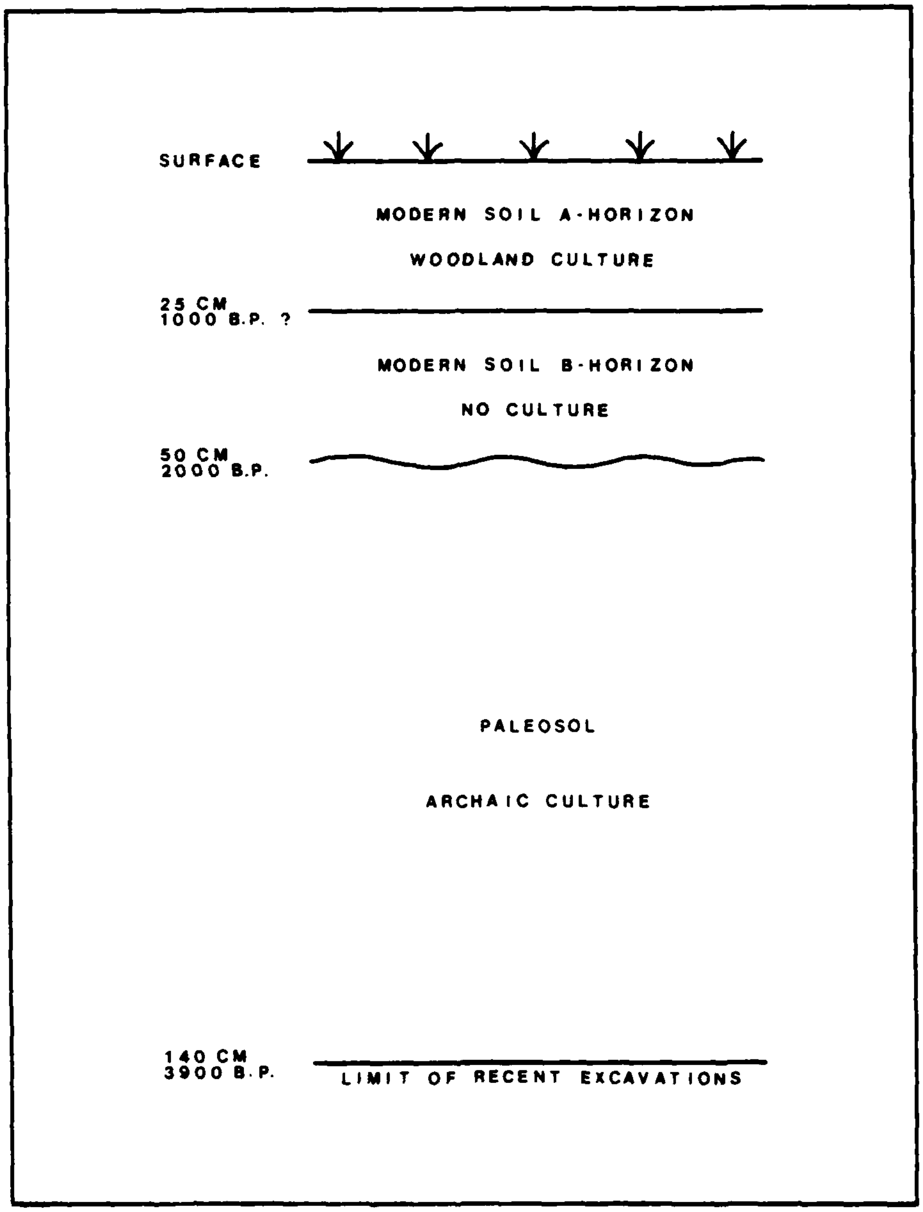

Figure 1.24. Postulated relationships of the paleosol to time and archeological remains, El Dorado Lake project; culture and dates from older excavations extend to about 250 cm. and 4800 B.P., and their relationships to the paleosol are unknown.

investigations at El Dorado Lake with potentially similar nearby studies. However, although there has been an abundance of similar valley archeological projects throughout the region, paleogeographical emphases have been mostly cursory in the immediate vicinity. Correlations of data are most profitable and meaningful within the same valley system; then between adjacent valley systems within the same drainage basin; and minimally between two valley systems within the same drainage basin. None of these conditions are so far possible for the Walnut River drainage basin. Another possible correlation would be between this drainage basin and another one close by which drains into the same major river, the Arkansas River.

Birch Creek and Hominy Creek

Two studies in small valleys, Birch Creek and Hominy Creek, (Fig. 1.25, 6) northwest of Tulsa, Oklahoma, which ultimately drain into the Arkansas River, have had some paleoenvironmental emphasis. However, the geological and archeological situations are quite different from El Dorado Lake in these valleys, and the time frame is even more restricted. At both Birch Creek (Henry 1977) and Hominy Creek (Henry 1978) all tested sites were either rockshelters or rockshelter caves, with entirely different kinds of problems from

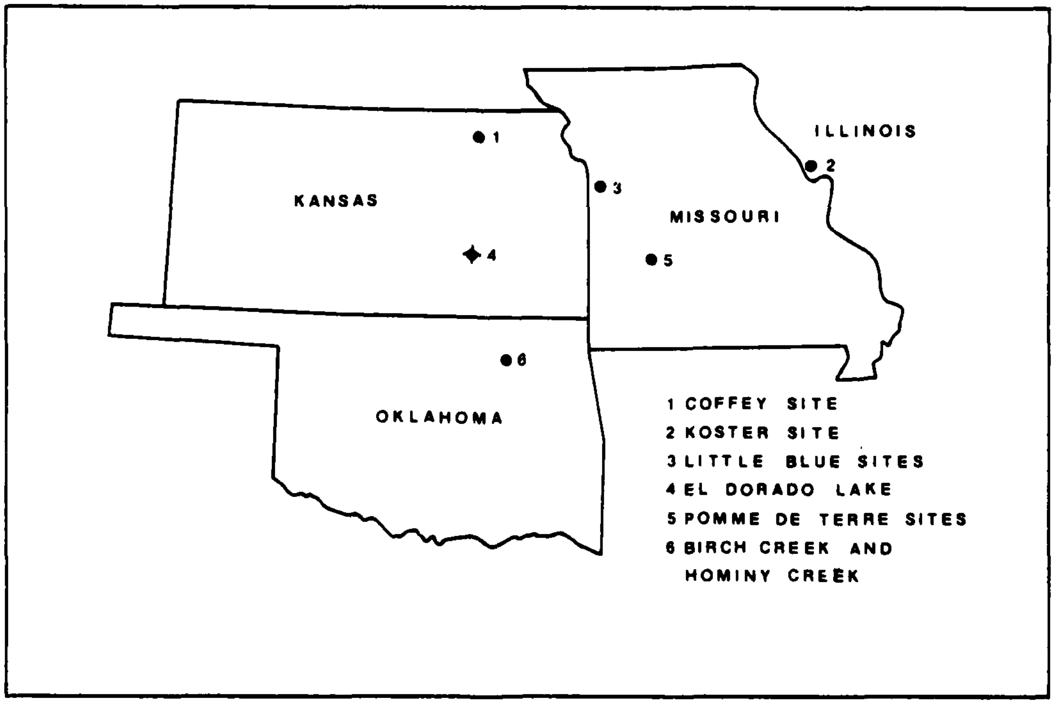

Figure 1.25. Locations of other studies in relation to the El Dorado Lake project.

those at El Dorado Lake; and, although radiometric dates were fairly abundant, the known record does not extend beyond 2000 B.P. in either valley, and to only half that along Birch Creek. Pollen and other fossil materials were recovered, however, to suggest that today's relatively arid climate began in that area about A.D. 800-900. This apparently had little impact on the prehistoric inhabitants.

Geologic studies at Birch Creek (Hall 1977) reveal that the alluvium is about 8 m. thick, and that it may be divided into two units, neither of which have been dated. Both are considered to be late Holocene. Unit A is of variable lithology and thickness, and is estimated to be 50-900 years in age. Unit B is a mottled yellowish-brown silty clay, and is estimated to range from 1000-2000 B.P. It forms a definite terrace with a step of as much as 2 m. in places, but it is also covered by Unit A in other places. On top of this unit is a 70-120 cm. thick A-horizon of a paleosol estimated to range from 1000-1500 B.P.

Henry (1978), in a review of several area valleys and the Verdigris River basin in general, points out several problems. Only late cultural materials have been recovered, there is a paucity of radiometric dates, sample sizes of cultural materials have been inadequate, and very little information on past environments is known. He believes that part of this could be due to many sites being deeply buried in alluvium and/or eroded away in the uplands. This thinking could also apply to El Dorado Lake and to the region as a whole.

The Coffey Site

At the northern end of the Flint Hills (see Fig. 1.1) in the Kansas River drainage, one of the major sites in Kansas exists along the Big Blue River north of Manhattan. This is the Coffey site (Schmits n.d.; Fig. 1.25, 1) at which one of the longest cultural sequences known from the eastern Plains has been uncovered. It is well controlled by 18 radiocarbon dates, and each cultural level is associated with specific fluvial sediments. A Pleistocene terrace exists at a height of 3.5 m. above the floodplain, upon which have been found Folsom, Late Paleo-Indian, and Archaic artifacts, indicating that the surface has been stable throughout the Holocene. This terrace is close to being the same elevation above the floodplain as T_1 (about 3 m.) is at El Dorado Lake, and it would seem to be a possible chronological correlate as well. Further, the topmost portion of this unit is described as being dark reddish-gray loam, quite like the A-horizon of the upland red unit at El Dorado Lake. Unlike El Dorado Lake, however, the Holocene alluvium at Coffey has excellent subdivisional indicators, and it has been broken into four subunits, while the lowermost of these has in turn been broken into three of its own. A major gap exists from the Pleistocene unit to 6285 B.P. when this unit begins. Most of the cultural levels are related to paleochannel fills in two successive oxbow lakes. Unfortunately we are not told the total thickness of the Holocene deposits.

Pomme de Terre Sites

In southwestern Missouri, extensive research has been carried out in conjunction with the construction of the Truman Reservoir on the Pomme de Terre River (Rig. 1.25, 5). Haynes (1976) has worked out the stratigraphic relationships of the valley in some detail, and they are quite complex. The modern floodplain surface (T_0) is underlain by alluvium ranging from about 400 B.P. at the top to about 800 B.P. at the bottom. Above the floodplain are two major fill terraces (T_1 and T_2). T_1, however, is a compound terrace. On one side of the river it has deposits ranging from 11,000-13,000 B.P. at the top to 28,000 B.P. at the bottom. This part is designated T_{1a}. On the other side of the river, this sequence has been removed at Rodgers Shelter and refilled with T_{1b} materials dating from about 11,000 B.P. at the bottom to about 1000 B.P. at the top. Deposition, however, essentially ceased by 6000 B.P., with this stabilization level corresponding to the T_{1a} level across the river. The higher terrace (T_2) seems to date from about 30,000 B.P. at the top to 38,000 B.P., or more, at the bottom. The floodplain, which itself is compound (T_{0a} and T_{0b}), is about 5 m. above the river bed, about the same as T_0 at El Dorado Lake, in many places. This may reflect similar cutting forces, but this floodplain unit is much more recent. The El Dorado Lake T_0 unit probably correlates with the Pomme de Terre T_{1b} unit in age, and the El Dorado T_1 red terrace deposits could correlate with the T_{1a} unit here.

Little Blue Sites

A great deal of work has been done in the Little Blue River Valley southeast of Kansas City, Missouri (Fig. 1.25, 3). Johnson (1978), who also was involved in the Truman Reservoir study (Johnson 1977), was able to quickly correlate the Little Blue deposits at the Sohn site with those in the Truman Reservoir, although not all the units existing in the latter area are present along the Little Blue. He claims there are two well defined terraces on the Little Blue, however his terminology is open to question. His lower terrace seems in reality to be the floodplain, and there would, therefore, be but one terrace above that. Standard procedure is to designate the floodplain as T_0 and the succeeding terraces as T_1, T_2, etc. (Schultz and Stout 1945; Leopold and Miller 1954). At any rate, his lower unit is a very dark grayish-brown silt loam (10YR 3/2), which is almost identical in color to the upper gray alluvium at El Dorado Lake (10YR 3/1), but it is much younger. He considers it very late Holocene, mostly less than 1000 years old; this age is also assigned to the floodplain unit near Rodgers Shelter. Here, too, this unit is about the same elevation (5.6 m.) above the river bed as at Rodgers Shelter and El Dorado. The stratigraphy has been obliterated by bioturbation and cannot be subdivided. There is a weak soil on its surface.

Johnson's upper unit at Little Blue is composed mostly of dark brown silt loam and has a better developed soil on it. The surface is 8.9 m. above the river bed, which corresponds to the red terrace (T_1) at El Dorado. This unit at Little Blue is much younger than the similar one at El Dorado, however. Johnson believes accumulation began about 11,000 B.P., and ceased for the most part about 2000 B.P., with 25-50 cm. of overbank deposits since that

time. This unit probably corresponds in age to the floodplain deposits at El Dorado.

Johnson predicts that buried in situ Archaic and Paleo-Indian sites will not be found within his lower unit, because it is too recent. No Woodland sites will be found buried within his upper unit, except in the upper 50 cm. as surface deposits carried down by plowing and/or bioturbation or as overbank deposits. These are reasonable and straightforward assumptions.

Brown (1979) reports Little Blue test excavations at eight sites, all post-3000 B.P., as indicated by 13 radiocarbon dates from four of the sites. All sites were either on the upper unit, or within its upper part. Much mixing was evident, with bioturbation in all sites. Mixing was also believed to be related to expansion and contraction of sediments caused both by cycles of freeze-thaw and wetting-drying. Human activities also seemed to be responsible for some of the disturbances. Paleoenvironmental indicators were few, although some microfaunal remains were recovered. Attempts were made to extract pollen, but none was obtained (King 1979b). Pollen decomposition had apparently occurred. Sediment cores were taken to depths of as much as 6 m. (well below cultural deposits). Particle size analyses (Filer and Sorenson 1977; Filer 1979) showed that the deposits were mostly silt and clay, and that deposition was consistent throughout, with no basis for subdivision. The sediments are considered to be entirely reworked loess from surrounding uplands (Anderson 1979). These sediment characters are consistent with conditions at El Dorado Lake, including type, source, mixing, lack of pollen, and general inability to subdivide.

The Koster Site

Butzer (1977) has made an extremely detailed study of the Koster Creek Valley and the nearby Illinois River Valley to which it is a minor tributary (Fig. 1.25, 2). The well-known multi-component Koster site is on Koster Creek. This area was directly influenced by multiple glaciations, making it very complex. Glacial features traceable to much of the Pleistocene exist here in profusion, and deposits are unusually deep within the glacially scoured valleys. However, as complex as the surrounding area is, the Koster site itself contains a very good record of the many fluctuations in regimes during its 11,000 year depositional history. The deposits are mostly well defined reworked Peoria Loess covering the entire Holocene. These are punctuated with a great number of major sedimentary breaks in the form of cultural levels, paleosols, radiometric dates, pollen, and color changes. This site, along with Rodgers Shelter and the Coffey site, shows what can be done when good subdivisional indicators are available, along with a long record of deposits. Butzer concludes that the many environmental fluctuations throughout the Holocene were correlated with cultural changes as well, from the earliest Archaic to the present. Downcutting prior to 10,000 B.P., he believes, either removed possible Paleo-Indian sites, or prevented their burial.

Indications are that the floodplain in the area of the Koster site built up rapidly from 10,000-5,000 B.P., and then stabilized. The first half of the buildup occurred within the first 2000 years of this span. This rapid

early Holocene accretion, followed by stabilization, and then later slower growth, was also detected at Rodgers Shelter, the Sohn site, and the Coffey site. The same depositional pattern may also have occurred in the upper alluvial unit at El Dorado Lake, where it is postulated that the Holocene sediments aggraded to 75% of their total thickness by 5,000 B.P. If the widely accepted model of Holocene climate, with increasing drying to an Altithermal peak from about 7,500-4,500 B.P., is valid, and valid for the Eastern Plains and the Midwest, there may be a relationship between this pattern of accretion and the drying phenomenon. That is, decline in rate of sedimentation may be due to a relative decline in moisture, while an increase in moisture may bring about a concomitant increase in alluviation, at least in this area. The thinking has long been equally divided between this view and its opposite, which states that increasing erosion and sedimentation accompany increasing drying and loss of plant cover. Perhaps more such studies will clarify this important issue. No direct evidence for the Altithermal has been detected at El Dorado Lake.

Future and Ancillary Projects

Field work thus far has provided a certain amount of useful information and a basis for additional studies. It is readily apparent that a great deal of effort must be devoted to the search for samples for dating and for other upper alluvial subdivisional indicators, including fossils which are needed for paleoecologic reconstruction. At this point, any such reconstruction must be based solely on the few fossils found in archeological contexts. Search for earlier archeological sites should also continue.

Efforts should be concentrated upon any new exposures opened by construction activities, but a number of new backhoe trenches would also be extremely worthwhile. Trench locations can now be more efficiently selected on the basis of completed drill holes and the geologic model presented in this report. These recommended cuts could prove to be useful in the discovery of much needed subdivisional indicators, and in the verification of certain presumed and/or questionable relationships. It is possible that the previously described minor cut terraces could in reality be fill terraces. Transects of these would likely settle the issue. If they should be fill terraces, major changes in the stratigraphic model would be necessary. Relations of the T_1 terrace to the floodplain could also be better understood by crosscutting in key places. In addition, the postulated relationship of the Vanoss soil series to archeological sites 14BU4 and 14BU9 may be resolvable through backhoe trenching.

More specifically, trenches are suggested at these places:

(1) at the Snyder site, 14BU9 (Fig. 1.5, 7); to determine if the minor cut terrace may be a fill terrace, and to clarify the Vanoss soil series issue; a trench here all the way to bedrock, groundwater permitting, is desirable;

(2) at archeological site 14BU4 (Fig. 1.5, 9); for the same purposes as in (1) above;

(3) at the east end of Lake El Dorado (Fig. 1.5, 6); to determine if the two minor cut terraces may be fill terraces, and to check out T_1 terrace relationships with the floodplain;

(4) at other minor cut terraces (Fig. 1.5, 17); to determine if these two cut terraces may be fill terraces;

(5) at the two known T_1 terrace scarps (Fig. 1.5, 3, 8); to check out T_1 terrace relationships with the floodplain;

(6) in an area on the east side of the Walnut River, 1 km. southwest of the junction of Durechen Creek with the Walnut River; to check out T_1 terrace relationships with the floodplain, and to test a filled depression; this depression is known to be eroded into the T_1 terrace and to be filled with Holocene alluvium to a depth of 2-4 m.; it is a likely feature in which to find buried cultural remains and subdivisional indicators.

In addition to work within the government reservation, supplemental field research should also be extended to places outside the project area for comparative purposes. Adjacent valleys should be examined, and it is especially important to correlate what is known in the upper Walnut River Valley with the downstream situation. Only a minimal amount of information is available for the valley in its southern portion (Bayne 1962), where it crosses Cowley County before joining the Arkansas River, and nothing is known for the intermediate section. It may be that these areas to the south can produce more data, which can in turn correlate with the El Dorado Lake sequence for better refinement.

Supplemental to actual field work, two major projects are envisioned. One of these requires that sediments collected in the course of geologic investigations (mostly from non-archeological contexts) be analyzed to verify certain conclusions drawn in the geologic model, and as a possible source for more information. These analyses may help to determine such things as environments of deposition, stream competence, stratigraphic breaks in the record, cycles of deposition, sources of sediments, shifts in channel position, etc.

The other major task involves the use of all the collected core plots and profiles and the recent Kansas Geological Survey drill hole data in an attempt to compile two kinds of subsurface maps. One map will be a "depth to bedrock contour map", in which the contours will depict the varying thicknesses of the regolith. The available data will also enable some stratigraphic and sediment correlation with field derived information. Such a map can constitute a framework of basic geologic knowledge which can provide better access for more detailed studies of sediments, stratigraphy, and buried archeological sites. That is, it can define vertical and horizontal limits for buried archeological sites by setting predictive limits for site locations and relative ages. Predictability of archeological site locations as to specific geologic units is particularly useful for salvage-type projects where recovery time is a major overall factor, and it is suggested that this approach be built into every such research design, as a necessary and early step. This map could perhaps set somewhat of a

precedent for future archeological salvage projects covering large areas and great numbers of sites. Without such subsurface information, most salvage archeology inevitably becomes concerned, almost exclusively, with surface sites, and thus with only the most recent times and cultures, with the almost total loss of possible millenia of data.

The second proposed map is a "bedrock surface configuration map", in which the contours of the bedrock surface are plotted. Unlike the depth to bedrock contour map, for which only regolith depths are needed for compilation, this second map requires knowledge of both regolith thickness and regolith surface elevations for each surface point above each depth reading.

The value of this map is geomorphic. Knowledge of the bedrock surface configuration can indicate topography and drainage patterns prior to the establishment of the modern Walnut River and its deposits, which would be useful in the overall paleogeographic reconstruction.

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CHAPTER 2

CHERT TYPES AND TERMINOLOGY FOR THE UPPER WALNUT RIVER DRAINAGE

Chérie E. Haury

Abstract

Primary and secondary deposits of chert derived from the Herington, Cresswell, and Florence limestone units provide the major prehistoric sources of knappable chert in the area drained by the upper Walnut River. Each of these lithologic beds is a member of the Chase Group of the Permian Series. In addition, there are three cherts found in prehistoric sites which are not from the immediate area. The sources of these are the Wreford and Foraker limestones in the southern Flint Hills and the Alibates formation of Texas. The bedrock sources of two cherts which are often observed in prehistoric assemblages have not yet been identified. These are referred to by descriptive names until more information becomes available.

Introduction

The following is a summary description of chert types and the terminology used to reference them in discussions of lithic assemblages throughout this volume. This data has been assembled as part of an on-going research project investigating the chert resources of the upper Walnut River drainage system and their utilization by prehistoric populations.

Chert Types

In the area drained by the upper Walnut River, i.e., from the sources of the Walnut and Whitewater Rivers south to the confluence of the Walnut and Little Walnut Rivers, there are three major physiographic formations which contain significant quantities of knappable chert. These are: bedrock exposures, regoliths in the uplands, and gravel bars and terraces in and along the river and its tributaries. The chert in secondary deposits (regoliths and stream gravels) is derived from three primary lithologic beds in the immediate area; the Herington, Cresswell, and Florence limestone members of the Chase Group. The Chase Group belongs to the Gearyan State of the Permian Series (Zeller 1968:plate 1).

Furthest to the west, the Herington limestone is visible as a low ledge along the Whitewater River. This dolomitic limestone averages 3-5 m. in thickness and is characterized by siliceous or calcareous geodes and concretions. Nodules of Herington chert tend to be small, 2-8 cm. in diameter, they have rough, crenulated surfaces and may contain druses (Bass

1929:98). They occur scattered on the surface of weathered exposures and can be gathered without digging or prying. In the vicinity of the upper Walnut they are rarely seen in the limestone itself.

The Cresswell limestone occurs as remnant outliers which form mesa-like features in the uplands of the central portion of the drainage. It is sometimes divided into two units: an upper unit composed of thin shaly limestone and a lower, massive unit which forms the conspicuous ledge which rises above the uplands (Bayne 1962:59). Chert is an irregular feature in this limestone but it occurs fairly commonly in this portion of the Flint Hills. Two varieties have been identified, though descriptions are not detailed: "purer chert", which occurs in small, thinly banded nodules, and "less pure", coarse, beige colored chert which occurs in larger nodules (Moore, Jewett, O'Connor 1951:8). Both types are remarkably homogeneous and contain no fossils. For the purposes of the current work both are termed Cresswell chert.

The Florence limestone is of primary importance in the upper Walnut drainage both in terms of topography and chert resources. This extensive unit can range in thickness from 3-14 m. (Zeller 1968:48) averaging 11 m. in the El Dorado area (Fath 1921:47). The upper portion of the Florence weathers more readily than the lower part forming a gently sloping, cherty upland surface in the eastern section of the drainage (Bayne 1962:55). The lower limestone is more resistant and forms the steep edge of the Flint Hills escarpment clearly visible to the east in Butler and Greenwood Counties (Bass 1929:14,79; Bayne 1962:55; Moore, Jewett, O'Connor 1951:44). Florence limestone is also exposed in the banks and beds of some of the area's streams.

The abundant chert in this formation occurs as nodules, often so closely spaced that they form a solid layer (Bass 1929:76; Bayne 1962:55). Two types of chert are recognized in the Florence limestone. One variety, referred to as Florence A, is tan to brown, contains a variety of fossils (especially fusulinids and gastropods), and is often banded. This variety is found in the prehistoric quarries near Maple City in Cowley County, Kansas (Wedel 1959:476-480) and near Hardy in Kay County, Oklahoma (Skinner 1957:41). In the past this chert has been referred to as Hardy Quarry chert, Maple City chert, and most commonly as Kay County chert. The second variety, Florence B in this volume, is described as occurring farther north in the Flint Hills (Bass 1929:77; Moore, Jewett, O'Connor 1951:9), it is dark gray or blue gray and contains silicified echinoid spines and other fossil fragments. The distinction of these two varieties is not detailed in the literature; however, Bayne (1962:55) describes the stratigraphic variation in fossil assemblages which parallels that observed in the chert varieties. "Echinoid spines and plates, crinoid fragments, and productids are common throughout the (upper and middle) beds of the limestone. Fusulinids are present in the lower half of the member." This suggests that the observed differences in the chert result from stratigraphic variations within the Florence limestone. Both of these chert types have been observed regularly in the bedrock outcrops, streams, and upland regoliths in the eastern half of the upper Walnut drainage.

There are three cherts which occur fairly regularly in El Dorado prehistoric sites that are not from the immediate drainage area. Two of

these, the Wreford and the Foraker cherts, occur in formations by those names within the southern Flint Hills. These bedrock formations are stratigraphically below the Florence limestone and are exposed farther east along the northeast-southwest trending line of the escarpment.

The Wreford limestone unit forms the capping ledge at the top of the second prominent eastward facing escarpment of the Flint Hills. It has two chert-bearing limestone members, the Schroyer limestone and the Threemile limestone. Chert from both of these is grouped as the Wreford chert. This chert is randomly mottled in varied shades of gray and contains a variety of silicified fossils many of which show detailed internal structure. Foranimifera, Bryozoa, and Gastropoda are the most common identifiable fossils. The Wreford chert occurs as nodules which are gradational with the limestone.

In the southeastern corner of Cowley County are bedrock exposures of Foraker limestone. All three members of the Foraker unit contain one general type of chert which occurs in nodular or lenticular masses parallel with the bedding planes. The Foraker limestone forms a scarp east of the Wreford escarpment and just above the steeply inclined slope formed by the shales of the Admire Group. The chert in this formation is very distinctive. It is coarse grained with a homogeneous gray ground mass. Its most distinctive feature is the preponderance of large (2-5 mm. in length) foraminifera which can be identified as Triticites and/or <u>Fusulina longissma</u> (Bass 1929:45). Many of these are unsilicified (will fizz slightly in cold HCL) and internal or external structure is well preserved.

The third kind of nonlocal chert reported in prehistoric sites comes from the Alibates formation of the Texas panhandle area. This fine grained, unfossiliferous, banded or mottled chert occurs in rich colors of deep red, blue, or purple, the reds being the most common color reported from El Dorado sites. Descriptions of this chert can be found in Shaeffer's (1958) publication on the Alibates Quarry site.

In addition to the cherts discussed above there are two types which are often observed in lithic assemblages from area prehistoric sites whose bedrock origins have not yet been identified. These are referred to simply by descriptive names, Flint Hills light gray and Flint Hills green. Flint Hills green exhibits very light gray to "pale olive" homogeneous coloring. It is very fine grained and does not contain any fossils. Occasionally thin red or rust colored veins may be observed. This chert may form a very dense, fine, white weathering cortex (i.e., does not fizz in HCL). Flint Hills light gray has a homogeneous light to dark gray ground mass and is heavily speckled with unidentifiable, white, silicified fossils. These appear only as splotched, irregularly oriented inclusions scattered randomly throughout the chert. In addition, Flint Hills light gray often contains small or large quartz druses.

In line with the chert resource survey's goal of presenting consistent, replicable descriptions of chert types (Haury 1978:220), Table 2.1 summarizes current descriptive data on the cherts of the upper Walnut River. This data is based on samples of chert gathered from known outcrops in the region. It is more detailed and, in fact, includes some distinct changes from the

descriptions pieced together from literature sources and presented at an earlier stage of the project (Haury 1979). Color terms given in quotes are after the Munsell Soil Color designations for the chips described by the standard alphanumeric system. Other terms follow Ireland's (1947) Terminology for Insoluable Residues.

Table 2.1. Description of the Common Cherts from the Upper Walnut River Drainage and Prehistoric Sites of the El Dorado Lake Area

FORAKER CHERT

Long Creek Ls. Member, Hughes Creek Sh. Member, and Americus Ls. Member
Foraker Limestone Unit
Council Grove Group
Gearyan Stage
Lower Permian Series

Color:	"Gray" - color homogeneous 7.5YR 6/0-5/0 on a fresh break 10YR 5/1 on an old surface "Light gray" 10YR 7/2, dense, fossiliferous cortex (fizzes in HCL)
Fossils:	Large (2-5 cm. long), unsilicified (fizz slightly in HCL), foraminifera (Triticites and/or Fusulina longissma) with internal structure at least partially visible
Texture:	Medium to coarse grain
Patina:	Light tan
Mode of Occurrence:	Nodular or lenticular masses parallel with the limestone bedding plane. Foraker limestone forms a scarp above the steeply inclined slope of the Admire Group.

HERINGTON CHERT

Nolans Limestone Unit
Chase Group
Gearyan Stage
Lower Permian Series

Color:	"Gray" to "dark gray" 2.5YR 5/0-4/0 on a fresh break, 10YR 5/4 on a patinated surface. Speckled with "weak red" 10YR 4/4 fossil inclusions (see below).
Fossils:	"Weak red" or rust colored, silicified, unidentifiable, small (less than 1 mm.). Fossil inclusions are randomly oriented and distributed throughout the chert.

Table 2.1. (continued)

Texture:	Fine to medium grain
Weathering:	May have a thick, porous, "white" to "pinkish white" 7.5YR 8/2 weathering rind (does not fizz in HCL) or a "reddish yellow" 7.5YR 6/6-4/6 patina.
Mode of Occurrence:	Nodules, commonly 5-8 cm. in diameter. Nodule surfaces crenulated imparting a "cauliflower-like" appearance. Nodules may be drusy. The limestone in the lower part of the unit is ledge-forming.

WREFORD CHERT

Schroyer Ls. Member and Threemile Ls. Member
Wreford Limestone Unit
Chase Group
Gearyan Stage
Lower Permian Series

Color:	Randomly mottled in shades of gray approximated by these ranges: lightest shades - 7.5YR 8/0-7/0 darkest shades - 10YR 6/1-5/1 Cortex (fizzes in HCL) is dense and often pitted "light yellowish brown" - "dark yellowish brown" 10YR 6/4-6-4/4.
Fossils:	Contains many fossils all silicified, many showing excellently detailed internal structure. Foraminifera, Bryozoa, and Gastropoda are most common along with fragments.
Texture:	Generally medium but the dark gray areas may exhibit a coarse texture.
Weathering:	A "yellow" 10YR 7/6 patina develops. Chert may grade gradually into a thick white, porous weathering rind (does not fizz in HCL).
Mode of Occurrence:	Nodules which are gradational with the limestone. The Wreford is the capping ledge at the top of the second prominent eastward facing escarpment in eastern Cowley County (Bayne 1962:49).

FLINT HILLS GREEN

Associations unknown

Color:	"Pale yellow" 5Y 7/3 to "pale olive" 5Y 6/3 - homogeneous

Table 2.1. (continued)

coloring. May have thin rust colored veins. Turns rust "yellowish red" 5YR 5/6 when heat treated.

Fossils: None

Texture: Very fine grained

Weathering: May form a very dense, fine white weathering rind (does not fizz in HCL).

Mode of Occurrence: Unknown

FLORENCE CHERT

Florence Ls. member
Barneston Limestone Unit
Chase Group
Gearyan Stage
Lower Permian Series

The Florence Ls. exhibits at least two distinguishable chert types. These apparently occur in stratigraphically distinct units. The upper unit (in the vacinity of Rosalia, Ks.) has been designated Florence A, while the chert occurring below that is referred to as Florence B. Description of this chert is separated on this basis.

Florence A

Color: Banded and/or mottled and/or speckled. Color may be "light gray" 10YR 7/1, 10YR 6/1-5/1, may have a "brownish yellow" 10YR 6/6 patina OR color may be "very pale brown" or "yellow" 10YR 8/2, 10YR 7/3-7/4 with scattered patches of "light yellowish brown" 2.5Y 6/4.

Fossils: Highly fossiliferous. Fossils are silicified and internal or external structures are sometimes preserved. Foraminifera and gastropods are identifiable - especially prominent are very large foraminifera. Fossils usually appear as the same color or darker than the surrounding matrix, creating the effect of dark speckles.

Texture: Medium

Weathering: May have a "very pale brown" 10YR 8/3-7/3, fossiliferous, rough, cortex (fizzes in HCL) OR a smoother, denser, "yellowish brown" 10YR 6/6-5/6 to "dark grayish brown" 10YR 4/2, fossiliferous, weathering rind (does not fizz in HCL). Patina - "brownish yellow" 10YR 6/6.

Table 2.1. (continued)

Mode of Occurrence:	Florence chert is distinctly nodular but, nodules may be so closely spaced that they merge together to form solid layers of chert. The lower portion of this formation is resistent to weathering and forms the steep escarpment farthest west in the Flint Hills. The upper part weathers more readily and forms gentle slopes strewn with residual chert.
Florence B	
Color:	Blue tones dominate the gray of this chert. Munsell chart for Gley most closely approximates the colors: lightest shades - N7/ "light gray" Gley intermediate shades - N7/ "light gray" Gley darkest shades - 2.5YR 5/0-4/0 May be a solid color or exhibit "structured mottling" with dark areas concentrated at the center grading outward into lighter colors. Exhibits a dense, white, fossiliferous, limestone cortex (fizzes in HCL).
Fossils:	May contain silicified fossils distributed differentially, most are highly fragmented. Sponge spicules or echinoid spines may be recognized in the dark areas near the center areas and occasionally small crinoids can be recognized.
Texture:	Generally medium texture but the dark areas at the center may be coarser than the surrounding chert. Pockets of quartz crystals are common and may be very large.
Weathering:	Develops a "yellow" or "brownish yellow" patina 10YR 8/6-7/6-6/6.
Mode of Occurrence:	Florence chert is distinctly nodular but, nodules may be so closely spaced that they merge together to form solid layers of chert. The lower portion of this formation is resistent to weathering and forms the steep, western-most escarpment of the Flint Hills. The upper part weathers more readily and forms gentle slopes strewn with residual chert.
FLINT HILLS LIGHT GRAY	
Associations unknown	
Color:	Homogeneous "light gray" 10YR 7/1 or 7/2 Heavily speckled with white silicified fossils (see below)

Table 2.1. (continued)

Fossils:	Small to medium, fragmented, silicified, unidentifiable, randomly oriented and scattered throughout the chert. Silicious fillings can be either fine grained or crystalline.
Weathering:	Develops a "yellow" 10YR 7/6-6/6 on lightly weathered surfaces or "yellowish brown" 10YR 5/6 and/or white on heavily weathered surfaces.
Mode of Occurrence:	Unknown (suspected to be nodular)

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CHAPTER 3

TEST EXCAVATIONS AT EL DORADO LAKE, 1978

Joe Alan Artz

Abstract

In the summer of 1978, a three person crew conducted test excavations on four sites in the El Dorado Lake area. Investigations collected data concerning the number, areal extent, internal structure, cultural affiliation, and geomorphic context of archeological components at each site. Surficial and excavated materials were subsequently analyzed to determine the nature and diversity of prehistoric activities enacted at the sites. A small, ephemeral encampment of Woodland peoples was represented at 14BU16. At 14BU81, evidence was found of at least two vertically stratified, materially dense, Late Archaic components, comparable in terms of site function and/or cultural affiliation to previously excavated, buried Archaic sites in the project area. The upland prairie context of 14BU89 and the predominance of hunting and butchering activities in its assemblage suggest that the site served as a Late Archaic hunting station or "staging area". At 14BU87, vertically stratified, diffuse residues of Woodland and Late Archaic (?) occupations were excavated.

Introduction

In the summer of 1978, as part of Phase II archeological investigations at El Dorado Lake, test excavations were conducted on four prehistoric archeological sites in the project area. As part of the intensive survey and test excavation programs outlined in the El Dorado project research design (Leaf 1976:Table 4; 1979:21-4), these investigations collected data concerning the number, areal extent, internal structure, and cultural affiliation of archeological components recognized at each site. The geomorphic context of the cultural deposit, and the relative state of preservation of organic remains were also studied. From the analysis of these data, the nature of the prehistoric occupations at each site was determined. This chapter presents results of both field and laboratory investigations. Based on these results, each site's significance as an archeological and cultural resource is assessed, and recommendations for further excavation or management of the site, if necessary, are made.

The four sites investigated in 1978 (14BU16, 14BU81, 14BU89, and 14BU87) were located in the northern end of the project area (Fig. 3.1). This represents a shift in the focus of the testing program, which in the 1977 season concentrated on sites in the lake's southern end, which were to be impacted by dam construction (Leaf 1979, Fig. 4.1). In 1978, the focus of construction activities was in the reservoir's northern end, involving 1) the relocation of the Kansas Turnpike, I-35, to a route just north of its current location, and 2) the construction of a new road bed for the

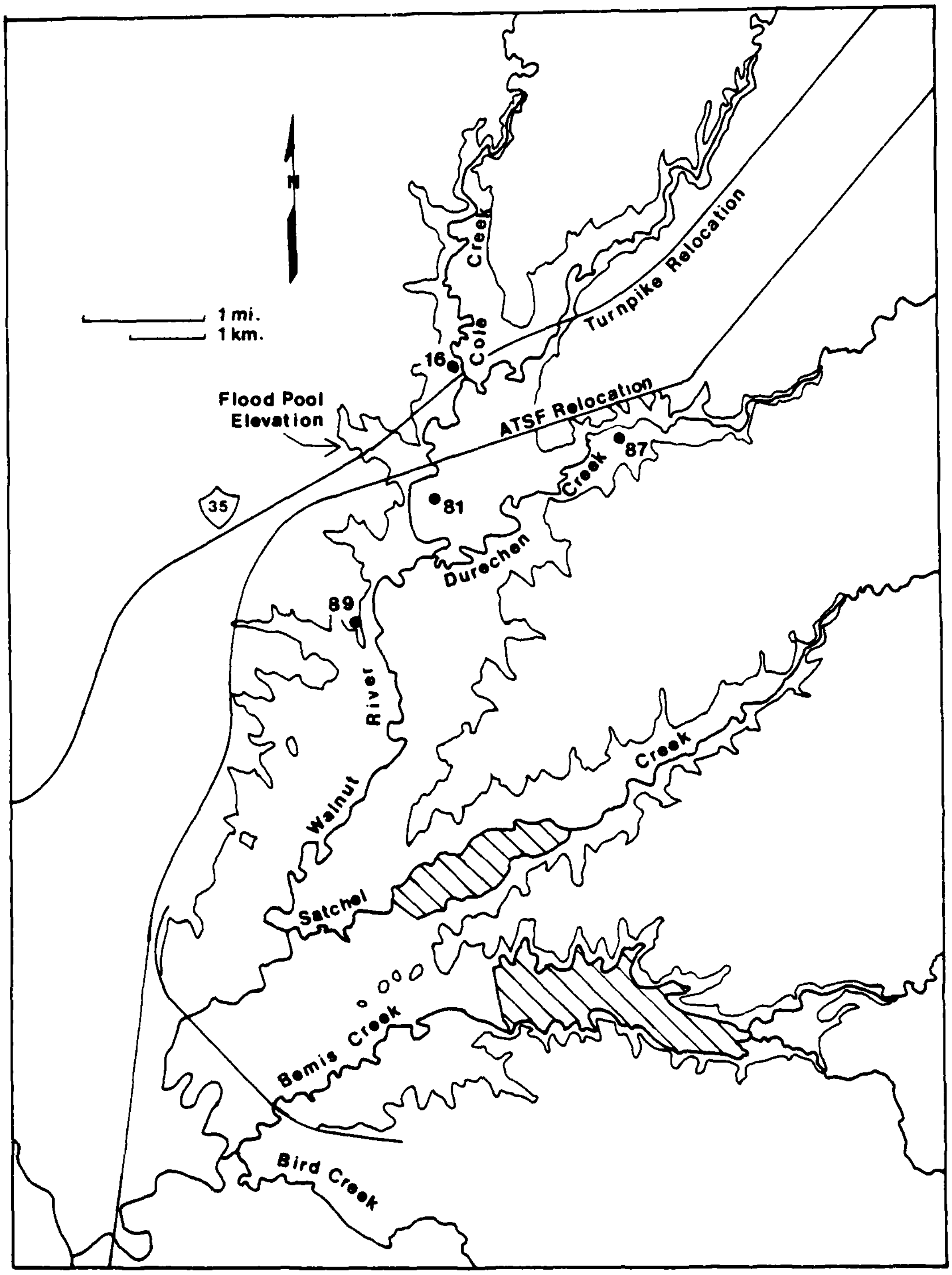

Figure 3.1. El Dorado Lake project area, showing locations of sites tested in 1978.

Atchison, Topeka and Santa Fe railroad (Fig. 3.1). Two sites, 14BU16 and 14BU81, were selected for testing because of their proximity to these construction activities.

The testing of 14BU89 and 14BU87 was undertaken to increase knowledge of prehistoric occupation and utilization of little-known sectors of the project area. Site 14BU89 was selected because of its location in an upland context, while 14BU87 was selected for its location in the upper end of Durechen Creek, and because of its posited Plains Village affiliation, associating it with an incompletely known period in El Dorado prehistory.

The investigations reported in this chapter were accomplished during an eight-week field season by a three person crew. Laboratory analysis was accomplished at the University of Kansas, Museum of Anthropology. The field and laboratory methods employed in these investigations are discussed below.

Field Methods

Since each of the four sites tested in 1978 was an essentially unique archeological manifestation, field procedures varied from site to site. Nevertheless, the investigations conformed to the general methodology outlined here. Particular variations of this methodology were enacted at each site and are detailed in the individual site reports.

The first task accomplished on each site was an intensive surface reconnaissance, which served to a) define site boundaries; b) define within-site areas of high debris density; and c) recover a large sample of surficial debris. A grab sampling technique was employed on all sites, in which all materials recovered were assigned a single surface provenience, without attempting to subdivide the site by gridding or otherwise demarcating intrasite provenience units. On 14BU89, where ground surface visibility was obscured by prairie grasses, the grab surface collection was augmented by an interval sampling procedure, described in the site report to follow.

Provenience control was established on each site by placing two to four monument hubs (2 by 2 in. wooden stakes) as permanent markers at protected points in fence-rows or treelines. The distance and bearings of these markers from an arbitrary on-site reference point were recorded. The reference point was given the designation within a Cartesian coordinate system of 500N500E from which coordinates for any point on the site were calculated. Coordinates of points increase with distance north and east of the reference point. Thus, the coordinates 480N530E refer to a point 20 m. south and 30 m. east of the on-site reference point. The reference point was assigned an elevation of 100 cm. below an arbitrary reference level, or datum. All elevations on the site were calculated in centimeters below the reference level, including those recorded on contour maps produced for each site. These maps illustrated topographic relief on the site and recorded the location of monument hubs, site boundaries, excavation units, and modern features such as roads, fences, and tree lines.

On every site, one to three 2 m. squares were opened. Decisions involved in locating these units were unique to each site and are considered in the individual site reports to follow. Test pits were excavated in 10 cm. levels except at 14BU81, where a 20 cm. plowzone was removed as a single unit. Depths were measured in centimeters from the highest outside corner of the test unit. Soil was screened through ¼ in. hardware cloth. For each excavated level, field notes were recorded, describing soil conditions, root and rodent disturbances, and cultural materials. As the excavation of each test pit was completed, profiles of one wall were photographed and drawn. Soil samples were taken at 10 cm. intervals from all test pits for subsequent analysis.

At all sites, a variety of auxiliary excavation units (backhoe trenches, posthole auger tests, and small-scale "shovel tests") were deployed. The rationale and procedures employed in establishing these units are discussed below on a site-by-site basis.

The final step in testing operations at each site was the backfilling of all test pits and auxiliary units. The only materials left on the site were the permanent monument hubs, to allow, if necessary, the relocation of the site.

Analytical Procedures

Laboratory analysis of the recovered assemblages in their recorded contexts was undertaken to assess the nature of each site's prehistoric occupation. The preliminary reports of assemblage variability presented in this chapter attempt to suggest the sets of behaviors which produced the archeological manifestations observed at each tested site.

In the analyses reported in this chapter, artifacts were first grouped according to commonly known materials such as chert, quartzite, sandstone, or limestone. The only material requiring definition is a coarse-grained, vesicular rock which has been identified as nodules of heavily patinated, highly weathered chert (Dr. R. Kaesler, University of Kansas, Department of Geology, personal communication to C. E. Haury). Previously reported by El Dorado researchers as "metamorphosed sedimentary rocks" (Fulmer 1976:79) and "dolomite" (Grosser 1970:90), the material is a common occurrence on upland surfaces in the southern Flint Hills (Bass 1929).

The most abundant material in the assemblages was chipped chert, the analysis of which began with the classification of specimens into operationally defined technological categories, or technoclasses. Technoclasses may be interpreted as the by-products and end-products of technological processes enacted by prehistoric people in manufacturing useable tools from unaltered chert, and in the subsequent use or maintenance of those manufactures. The present analysis considers four basic stages in characterizing the lithic technologies of each site. These are a) the initial reduction of unaltered raw material; b) the intermediate reduction of the products of initial reduction; c) the final shaping of selected pieces into utilizeable forms; and d) the subsequent maintenance or reshaping of those

forms. The technoclasses employed in this analysis are defined below and related to the above four stage model.

Utilized or tested raw materials are pieces of chert (usually alluvial cobbles) whose aboriginal modification was restricted to the removal of a few flakes. If these flake removals form a functional edge (such as one suitable for chopping), then the specimen is classified as utilized. If not, the specimen is classed as tested, implying that the flake removals represent an attempt by the aboriginal artisan to determine the specimen's suitability for further reduction. In either form, the specimen represents the procurement and initial reduction of unaltered raw materials.

Specimens included in the technoclass, core, are recognized by the presence of well-defined negative flake scars which identify one or more surfaces as striking platforms from which flakes were struck. Cores vary considerably in shape and size. Some possess cortical surfaces suggesting their manufacture from unaltered raw material. Others are carefully shaped and prepared, and represent the intermediate stage of reduction.

Flakes, a category which subsumes the three technoclasses of decortication flakes, intermediate flakes, and bifacial trimming flakes, possess a ventral surface, identified by features of conchoidal fracture such as bulbs of percussion, striking platform remnants, flake ripples or waves, and hinge fracture terminations. These basic attributes are illustrated by Bordaz (1970) and Oakley (1966).

Decortication flakes are defined by the presence of cortex (the naturally weathered surface of the original raw material) on at least 50% of the dorsal surface of the flake. Decortication flakes provide evidence that the initial reduction of relatively unaltered raw materials was an activity performed at the site.

Bifacial trimming flakes are characterized by a multifaceted striking platform, which forms an acute angle with the flake's dorsal surface and "lips over" or "overhangs" the flake's ventral surface. Such flakes are easily recognized, since the juncture of the platform and the dorsal surface represents the edge of the bifacial tool from which the flake was struck (Frison 1968:149; Henry 1978:10). Bifacial trimming flakes represent either the manufacture or maintenance of bifacial tools (Frison 1968:150), and thus characterize the third and fourth stages in the generalized reduction sequence used in this analysis.

Intermediate flakes are those specimens not classifiable as either bifacial trimming or decortication flakes, and which, in general, represent intermediate stages of reduction. In the preliminary analysis presented here, no attempt is made to further subdivide the intermediate flake category.

Chunks are defined as blocky fragments of chert not classifiable as either flakes or cores. Cortical chunks (chunks which possess cortex on one or more surfaces) represent the initial reduction of raw materials, while noncortical chunks represent intermediate stages of reduction.

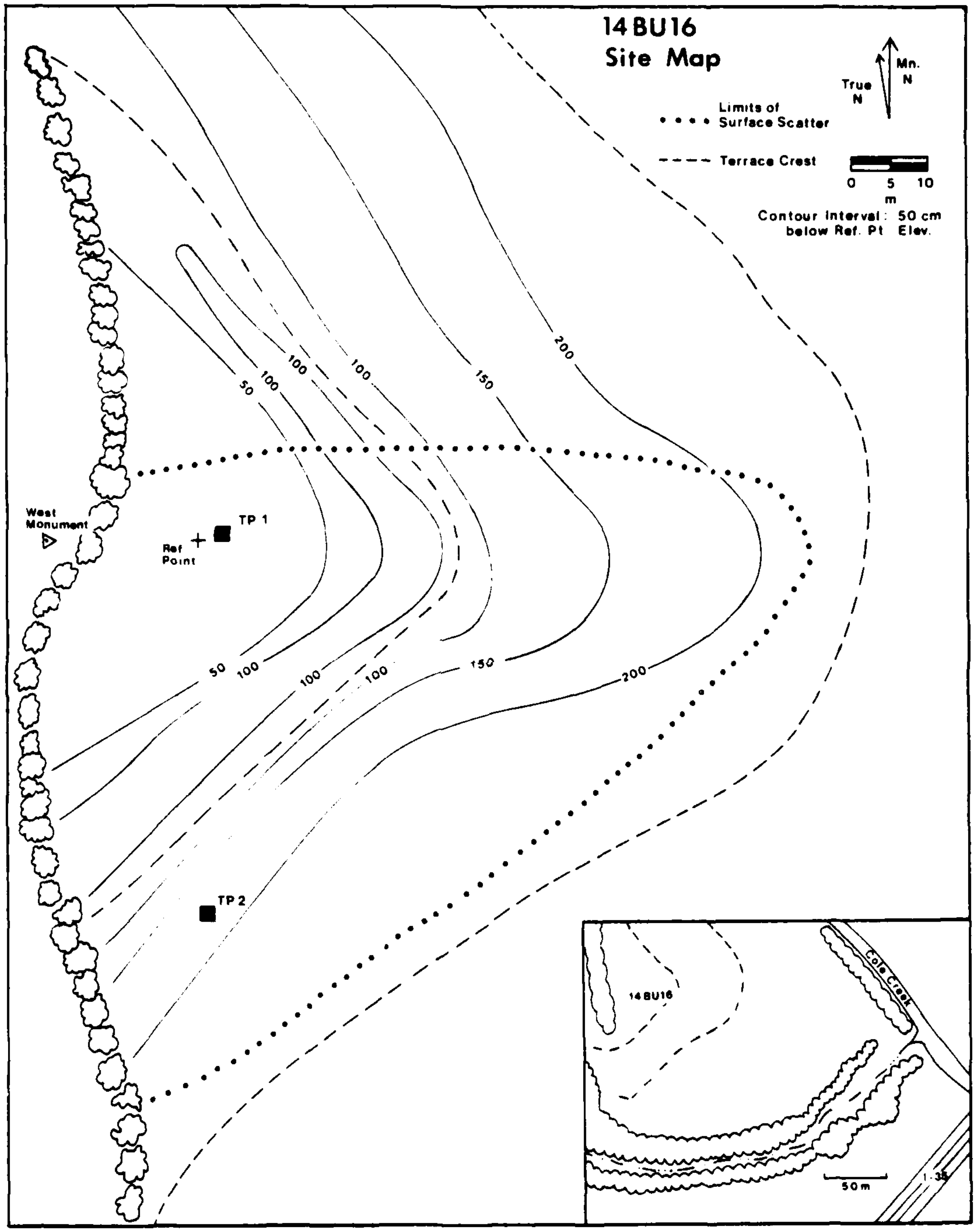

Figure 3.2. Site map of 14BU16, with inset showing site's relationship to nearby stream. Inset drawn from U.S.C.E. 1:200 topographic maps.

The final technoclass, shaped tools, consists of chert artifacts which are the product of the trimming of selected chert blanks, presumably to achieve a desired form. Shaped tools are further divided for analysis into morphological-functional categories such as projectile points, scrapers, and drills.

Chert materials from the assemblages are further classified according to chert types currently recognized by El Dorado researchers. Definitions of these chert types are provided by Haury (Chapter 2, this volume). Evidence of thermal alteration of chipped stone is also noted, using criteria developed by Crabtree and Butler (1964) and Purdy (1975).

Categorization of chipped stone materials in terms of chert type, thermal alteration, and general technological stage allows preliminary statements to be made concerning procurement and manufacture of chipped stone artifacts by each site's occupants. In addition to these inferences, a morphological classification of shaped tools permits tentative identification of subsistence-related activities undertaken at, of from, individual sites. In general, only macroscopically apparent features of tool edges have been employed, as microwear analysis was considered beyond the scope of the present study.

The artifact analyses presented here provide a general understanding of activities engaged in at each site by the prehistoric occupants. These statements provide useful information in assessing site significance and recommending future actions regarding the sites. In addition, the analysis will hopefully provide guidance for future studies of El Dorado prehistory.

14BU16

Physical Description

Site 14BU16 is located on the western margin of the floodplain of Cole Creek, 370 m. northwest of the creek's confluence with the Walnut River. The site is situated 3 m. above the floodplain occupying the southeastern terminus of a natural terrace remnant. This feature slopes toward the Cole Creek floodplain on the east, and toward the course of an unnamed intermittent tributary on the west.

Terrain in the site's immediate vicinity has been considerably altered from its prehistoric configuration. Construction of the Kansas Turnpike (I-35) prompted rechannelization of the lowest reaches of Cole Creek, the course of which was straightened to more directly intercept the Walnut River. Prior to this straightening, Cole Creek meandered westward, joining with its unnamed tributary before swinging southward to intercept the Walnut 300 m. southwest of the present confluence (Fig. 3.2, inset).

The ridge occupied by 14BU16 is mapped by the Butler County Soil Survey U.S.D.A. 1975,map 23) as "Norge silty clay loam, 3 to 50 percent slopes, eroded". The erodibility of the soil led to the construction of four agricultural terraces along the valley slopes bordering the Cole Creek

floodplain. These terraces extend from the southern terminus of Cole Creek's valley for over a mile northward, up the valley. Two of these terraces cross 14BU16, as indicated on the site map; their construction resulted in the destruction of portions of the site.

Situated at an elevation of 1340 feet above mean sea level, 14BU16 lies within El Dorado Lake's multipurpose pool. The site, however, was impacted prior to its inundation by borrowing activities associated with the relocation of the Kansas Turnpike. The site lies within an area scheduled for use as a borrow pit, and was completely destroyed in the spring of 1979. The 1978 excavations were undertaken to assess the extent of, and mitigate the loss of, this cultural resource.

Archeological Investigations

Site 14BU16 was first recorded in 1967 by a University of Kansas survey crew. A small sample of surface material was collected at that time (Eoff and Johnson 1968). In 1978, when University of Kansas personnel returned to 14BU16, vegetation cover on the site consisted of grass, a condition which interfered with attempts to collect a sample of surface remains and delimit site boundaries. Most of the occupational debris observed and collected occurred on the hillslope between the two agricultural terraces, where a relatively thin grass cover allowed adequate surface visibility. Although surface debris was not observed on the level surface at the top of the slope, this was a function of the denser vegetation cover in this area. Thus, based on the extent of debris between the terraces, site boundaries were extrapolated to include a reasonable portion of the hilltop, and subsequent test excavations were planned to verify this extrapolation.

The floodplain of Cole Creek, extending from the foot of the terrace to the treeline bounding the creek, was overgrown by a dense cover of head-high weeds. Surface reconnaissance in this area was restricted largely to the observation of exposed ground surface in small open patches within the dense cover. Numerous small "shovel tests" were also performed, but neither procedure provided evidence for the site's extension onto the floodplain. Additional shovel tests were carried out on the valley slope for several hundred meters west of the site, but these likewise failed to produce evidence for the site's extension beyond the limits suggested by observed surface scatter.

Thus, surficial evidence for prehistoric occupation at 14BU16 was restricted to the tip of a natural terrace overlooking the floodplain of Cole Creek. As delimited in Figure 3.2, the site covers an area of approximately .52 ha.

Two test squares were opened on 14BU16. The excavation of these 2 by 2 m. units was intended, in part, to assess the extent of damage done to the site by agricultural terracing. To determine if an intact portion of the site could be located, Test Pit 1 was placed on top of the ridge, approximately 20 m. from the highest man-made terrace, and 2 m. east of the on-site reference point. To determine the effect of terrace construction on a cultural deposit at the site, Test Pit 2 was located on the

hillslope between the two agricultural terraces. The precise location, 50 m. south of the site reference point, was also chosen to coincide with a relatively dense concentration of surface debris noted in the course of earlier surface reconnaissance.

Site Stratigraphy

Test Pit 1 (TP 1) was excavated in arbitrary 10 cm. levels to a depth of 40 cm. in its eastern half (the SE and NE quadrants), and to a depth of 50 cm. in its western half (SW and NW quadrants). As predicted, the stratigraphy revealed in this unit showed no evidence of disturbance by agricultural terrace construction. The soil profile (Fig. 3.3) corresponds to that of a typical Norge series soil, as described by the U.S.D.A. Soil Survey (1975:16). The upper horizon is a dark reddish brown (5YR 3/2), silty loam A1 horizon, ranging in depth from 15 to 20 cm. No evidence of cultivation, in the form of a distinguishable plowzone, was apparent in this horizon. The surface horizon is underlain by a reddish brown (5YR 5/3 to 5YR 4/3), silty clay B horizon. Naturally occurring flecks of iron and manganese were observed throughout the B horizon, becoming more frequent with increasing depth. Traces of root channels and rodent burrows were observed throughout the excavated area.

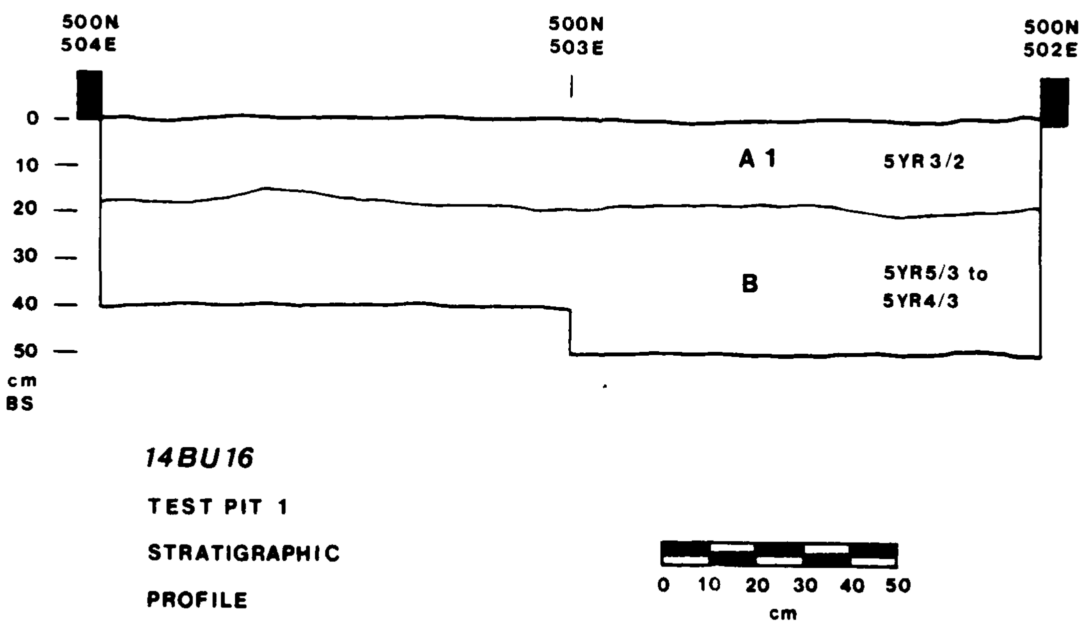

Figure 3.3. Stratigraphic profile, TP 1, 14BU16. Soil horizon designations after U.S.D.A. (1975).

Although TP 1 was not dug below a depth of 50 cm., a soil auger was used to examine stratigraphy for an additional 1.55 m. below the excavation's floor. No major stratigraphic changes were observed; and no evidence of a buried occupation was recovered.

The distribution of the small number of recovered chert elements from TP 1 (Table 3.1) demonstrates that most cultural materials were confined to the A1 horizon. Given the evidence of extensive root and rodent activity

Table 3.1. Vertical distribution of artifacts, TP 1, 14BU16.

Level (cm.)	No. of Artifacts
00-10	16
10-20	8
20-30	4
30-40	3
40-50	1

in the solum, there is no reason to suspect that the presence of small pieces of chipped stone at depths of up to 50 cm. is due to anything but the downward migration of small particles by natural processes. Thus, it seems reasonable to infer that the occupational residue was stratigraphically restricted to the upper 20 cm. of the site's A1 horizon.

Test Pit 2 (TP 2), located on a slope between two agricultural terraces, was excavated to a depth of 20 cm. below surface in its SW and NW quadrants, and to a depth of 10 cm. in its SE and NE quadrants. As shown in Figure 3.4, the A1 horizon observed in TP 1 was absent from the profile of TP 2. Instead, the reddish, clayey B horizon extended to the ground surface. At 15 cm. in the western half of the square, and at 5 cm. in the eastern half, a layer of evenly-scattered, highly weathered fragments of limestone, ranging in diameter from 1 to 3 cm., was encountered. The small size and uniform distribution of these particles, along with the fact that neither the fragments nor the surrounding matrix showed evidence of burning, suggested that the limestone layer was of natural origin. A soil auger test in the floor of TP 2 indicated the continuous presence of fragmented limestone to a depth of 75 cm., which is further evidence of the layer's natural origin. Possibly, the material represents an accumulation of colluvium at the foot of the steeply sloping natural terrace. Approximately 80 cm. below the surface at TP 2, the reddish brown B horizon gradually changed to a yellowish red (5YR 5/6) soil unit. Less clayey than the overlying horizons, this unit

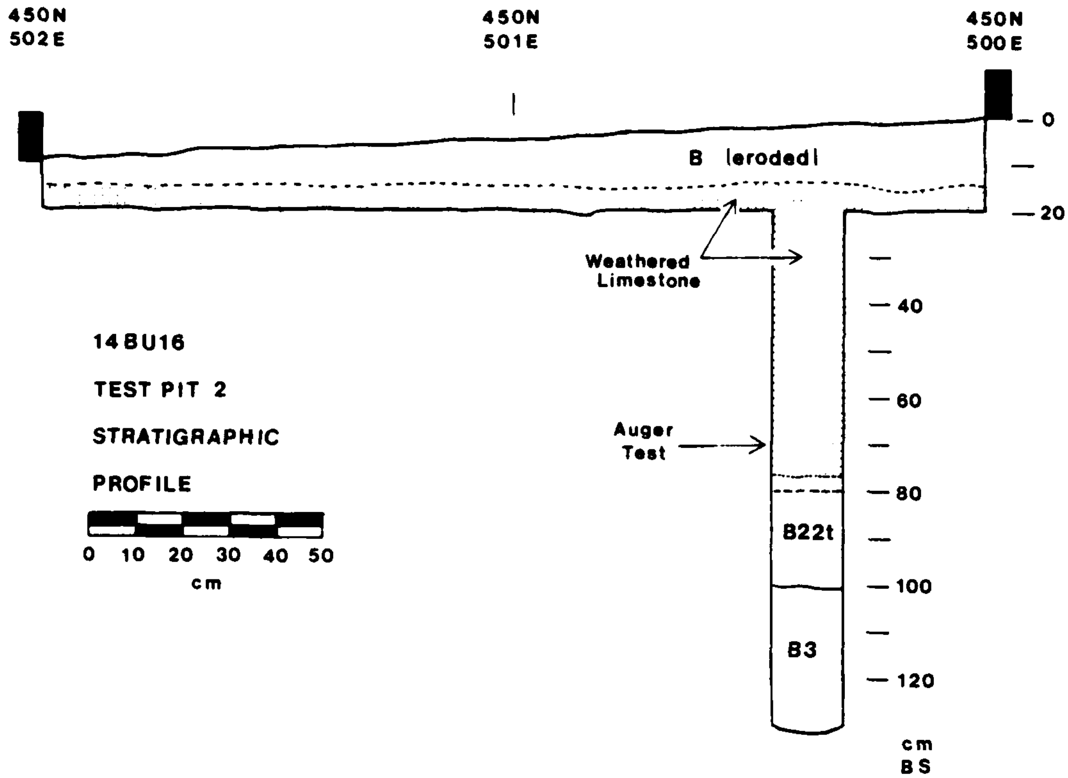

Figure 3.4. Stratigraphic profile, TP 2, 14BU16. Soil horizon designations after U.S.D.A. (1975).

corresponds to the B22t horizon described for Norge soils in the Soil Survey of Butler County (U.S.D.A. 1975:16). At approximately 1 m. below the surface, the silty clay loam B3 horizon, also yellowish red in color, was encountered. No cultural material was recovered from the auger test in TP 2.

The primary disturbance evidenced in Test Pit 2, the removal of the upper A1 horizon, is most reasonably attributed to sever erosion of soil from the sloping areas of the site. No direct evidence of disturbance due to the construction of terraces on the slope was noted. Further evidence for the effect of soil erosion was the sparse vegetation cover on the slopes of the site, through which the reddish B horizon could be discerned. Also, the presence of a lightly developed, rust colored patina on many of the artifacts recovered from the site's slopes suggests exposure to water action.

Since the distribution of cultural materials in TP 1 shows that the cultural deposit is completely contained in the A1 horizon, the complete removal of that horizon from sloping site surfaces had a severe effect on the integrity of the cultural deposit. It is probable that the "concentration" of artifacts over which TP 2 was placed resulted from the collapse

of an occupational zone onto an erosional surface, and that this process might have continued had it not been arrested by construction of agricultural terraces. Ironically, although the destructive nature of terrace construction cannot be denied, terracing of slopes, in the long run, may have contributed to the site's preservation by stabilizing the even more destructive process of soil erosion.

The field results discussed above suggest that 14BU16 contains a single archeological component, which is partially exposed on the surface, but primarily contained within the upper 20 cm. of uneroded portions of the site. A consideration of projectile point styles, to be discussed below, indicates a Plains Woodland cultural affiliation for this component.

Artifact Analysis

A total of 255 artifacts was recovered from 14BU16, 249 of which are of chipped stone. Five pieces of limestone and one piece of weathered chert complete the inventory. Faunal and floral materials were not recovered, indicating poor preservation of organic materials at the site. The distribution of the three raw material categories among provenience units is shown in Table 3.2. To compensate for small sample sizes, artifacts from all provenience units are considered together in the following discussions.

Table 3.2. Distribution of artifacts by provenience units at 14BU16.

Raw Material Category	Grab Surface Collection	Test Pit 1	Test Pit 2	Total
Limestone	4	1	-	5
Weathered Chert	1	-	-	1
Chipped Stone	189	31	29	249
Total	194	32	29	255

Limestone

All five pieces of limestone evinced the reddish discoloration and chalky textures indicative of exposure to heat sources. Since these specimens were not recovered in association with intact cultural features, such as hearths or roasting pits, the possibility of a natural firing cannot be disregarded. However, in a following section, it is demonstrated that a natural firing cannot account for the thermal alteration of chert.

Weathered Chert

One small piece of weathered chert, weighing 6.4 gm. and having a maximum dimension of 23 mm., was recovered from the site. Although one surface of the piece is relatively smooth and exhibits a shallow pitting, the fragmentary nature of the specimen precludes a conclusive functional interpretation.

Chipped Stone

In the assemblage of 246 chipped stone artifacts, nine technological categories are recognized. These are distributed among four classes of chert raw material, as shown in Table 3.3. Florence A chert was the numerically

Table 3.3. Chert type and thermal alteration of chipped stone technoclasses (14BU16).

	Florence A		Florence B		Light Gray		Ind./Misc.		Total	
Technoclass	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
Utilized Cobble	-	-	-	-	-	1	-	-	-	1
total:	-		-		1		-		1	
Core	-	1	-	-	-	-	-	-	-	1
total:	1		-		-		-		1	
Cortical Chunk	-	9	-	2	-	-	1	-	1	11
total:	9		2		-		1		12	
Decor. Flake	-	11	-	3	-	1	-	4	-	19
total:	11		3		1		4		19	
Int. Flake	24	74	1	27	-	17	12	27	37	145
total:	98		28		17		39		182	
Noncor. Chunk	1	1	2	5	-	-	1	-	4	6
total:	2		7		-		1		10	
Bif. Trim. Flake	1	1	1	-	-	-	3	-	5	1
total:	2		1		-		3		6	
Shaped Tool	4	4	-	2	-	-	-	1	4	7
total:	8		2		-		1		11	
Thermo. Shatter							4	-	4	-
total:							4		4	
TOTAL	30	101	4	39	-	19	21	32	5	191
total:	131		43		19		53		246	

dominant material, accounting for 52% of the assemblage. The only core recovered from 14BU16 is of this material. In addition, decortication flakes, chunks, intermediate flakes, bifacial trimming flakes and shaped tools of Florence A are present, in proportions presented in Table 3.3.

Artifacts identified as Florence B chert comprise 17% of the assemblage by number. The same technological categories are represented by Florence B artifacts as by Florence A artifacts, with the exception that no complete cores of Florence B chert were recovered.

The chert type Flint Hills light gray is represented by only 19 artifacts (8% of the assemblage), including one utilized cobble, one decortication flake and 17 intermediate flakes. No cores, chunks, bifacial trimming flakes or tools of the material are present in the assemblage.

The fourth raw material category, "indeterminant/miscellaneous", contains 57 artifacts (23% of the assemblage by number). All technoclasses except cores and cobbles are represented.

The procurement of chert raw material is represented at 14BU16 by a single large alluvial cobble of Flint Hills light gray chert. Although the presence of this specimen might suggest an available source of raw material near the site, there is no evidence for the extensive on-site use of this material. Most likely, the cobble was carried onto the site to serve as a tool, then discarded.

The production of flakes from cores is directly evidenced by a single core. This specimen, made of Florence A chert, is rather small (38.5 gm.). A light hydration patina observed on two opposed faces of the core indicates that it was fashioned from a tabular piece of chert, 22 mm. thick and at least 50 mm. in maximum breadth. The largest of the two weathered surfaces served as a striking platform for the detachment of small flakes along two margins of the core. The angle formed between the flake scars and the striking platform is acute, ranging from 50° to 65°. Flake detachment resulted in the isolation of a narrow "keel" of the original weathered surface on the face opposite the striking platform.

Although no cores of Florence B chert were recovered, the prehistoric presence of such a core (or cores) might be indicated by a specimen classified as one of the three Florence B chert decortication flakes. The specimen (Fig. 3.5 d,e) resembles those described by Aigner (1970:62), Anderson (1970:8), and Montet-White (1963:22) as resulting from the rejuvination of a core's striking platform. Core rejuvenation is accomplished by means of a transverse blow, which removes the entire core platform, exposing a fresh surface which may serve as a platform for further reduction. The dorsal surface of the rejuvenation flake represents the old platform of the core, while the margins of the flake bear the negative scars of previously removed flakes, all originating from the old platform surface.

The Florence B chert specimen discussed here (Fig. 3.5d,e) has such features and, in addition, possesses several features in common with the complete Florence A core discussed above. First, it is small, measuring 50 mm. in its maximum dimension. Second, the flake's dorsal surface (the

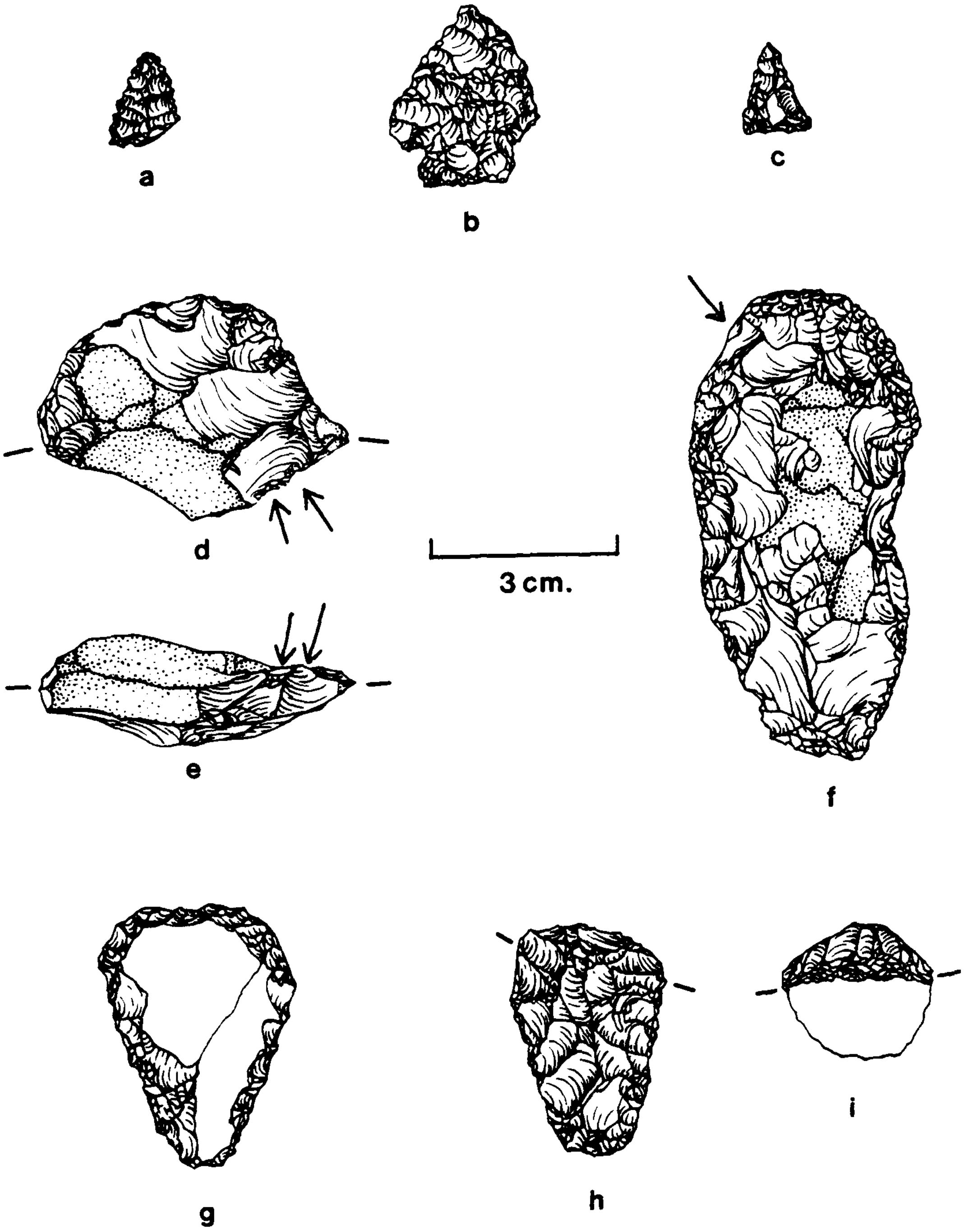

Figure 3.5. Shaped tools from 14BU16: (a,b) projectile points; (c) small, unnotched biface; (d,e) core rejuvenation flake, dorsal and lateral views (arrows indicate origins of flakes struck from core); (f) "adze-like" biface (arrow indicates origin of impact fracture); (g) endscraper; (h,i) endscraper, dorsal view and oblique view of distal end showing heavy utilization.

Table 3.4. Weight and number of debitage elements from 14BU16.

Technoclass	Florence A		Florence B		Flint Hills Light Gray		Ind. Misc.		Total	
	No.	Wt.*	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Decortication Flakes, Cortical Chunks	20	68.2	5	98.1	1	3.1	5	19.9	31	189.1
Intermediate Flakes, Non-Cortical Chunks	99	113.6	35	53.7	17	33.2	40	33.5	191	234.0
Bifacial Trimming Flakes	2	1.0	1	0.1	-	-	3	10.7	6	11.8
Total	121	182.8	41	151.9	18	36.3	48	64.1	228	434.9

*Weight in grams.

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platform of the inferred core) has remnants of a heavy hydration patina indicating that the core was formed directly from a relatively unaltered piece of raw material. Third, the flake scars around the margins of the specimen (indicated by arrows in Fig. 3.5d) form acute angles with their platform, as observed on the Florence A core.

Although cores were present on 14BU16, there is little evidence that they were prepared on the site from larger pieces of raw material. If that had been the case, one would expect the occurrence of substantial numbers of decortication elements; i.e., decortication flakes and cortical chunks. At 14BU16, such elements are not numerous (Table 3.4), accounting for only 12% (31 elements) of the chipped stone assemblage. In the case of Florence A chert, decortication elements tend to be small; the 20 specimens have a mean weight of 3.41 gm. (Table 3.5). Although the mean weight of Florence B decortication elements is considerably larger (19.62 gm.), only five such elements are present. One small (3.1 gm.) decortication flake of Flint Hills light gray chert was recovered. Likewise, the five decortication elements of indeterminant or miscellaneous chert types are small, with a mean weight of 3.98 gm. The small size and/or small numbers of decortication elements in the assemblage suggest that the initial trimming of large pieces of chert raw material was not a prevalent technological activity at 14BU16.

The scanty evidence for initial reduction at the site can be contrasted with the comparatively large numbers of intermediate flakes and noncortical chunks (intermediate elements). The small sizes (see Table 3.5), and large quantities of these elements indicate that a major technological activity at the site was the production of small flakes, most likely from small, single platform cores such as those discussed above. In general, the size of intermediate elements do not vary significantly with raw material, as indicated by the mean weights shown in Table 3.5. This suggests that their production operated independently of raw material, and that in subsequent analysis of the assemblage, a demonstrable technological uniformity of flake

Table 3.5. Mean weight, in grams, of debitage elements, 14BU16.

Technoclass	Florence A	Florence B	Flint Hills Light Gray	Ind./ Misc.	Mean Wt. Total
Decortication Flakes, Cortical Chunks	3.41	19.62	3.10	3.98	6.10
Intermediate Flakes, Non-Cortical Chunks	1.14	1.53	1.95	0.84	1.23
Bifacial Trimming Flakes	0.05	0.10	-	3.57	1.97

production might be expected. Evidence for the independence of technology and raw material is also seen in the morphological similarity of the Florence A core and the postulated Florence B core fragment.

The purpose of prehistoric flake production is not immediately apparent. The detachment of blanks for tool manufacture is not a likely goal, since the six bifacial trimming flakes offer little evidence for tool manufacture or maintenance at 14BU16. It is suggested that a possible goal of small flake production at the site might have been the provision of quantities of flakes for use as opportunistically-manufactured, ad hoc tools in the performance of various tasks.

Fifty-seven elements (23% of the chipped stone assemblage) show evidence of thermal alteration, primarily in the form of heat discoloration. As shown in Table 3.3, 37 of these (65% of all heat-treated artifacts) are classified as intermediate flakes, the remainder being classified as bifacial trimming flakes (5), shaped tools (4), and noncortical chunks (11). No cores, cobbles, decortication flakes or cortical chunks were heat treated, indicating that thermal alteration was confined to the intermediate and final stages of reduction.

As shown in Table 3.3, 29 of the thermally altered elements are identified as Florence A chert. Only four Florence B artifacts (two noncortical chunks, one intermediate flake, and one bifacial trimming flake) exhibit thermal alteration, while no heat-treated specimens of Flint Hills light gray chert were observed. Although the remaining 24 elements of heated chert are of unidentifiable materials, this high proportion is essentially an analytical bias, since heat discoloration obscures many of the features currently used by El Dorado researchers to distinguish various chert types.

The intentional application of heat to chert is clearly demonstrated at 14BU16. An alternative interpretation, that chert was accidentally exposed to heat sources, can be rejected, since if this were the case, one would expect all technoclasses and chert types to show essentially equal proportions of heated to non-heated artifacts. The high proportions of heat treated Florence A chert, and the exclusion of heat treatment from the initial stages of reduction (cores, cobbles, and decortication elements) argue against this alternative.

Without further data, it is not possible to explain the apparent preferential selection of Florence A chert for thermal alteration. It is interesting that such selectivity should be evident, given the posited homogeneity in technological treatment of raw materials at the intermediate stages of reduction.

The high proportion (five out of six) of thermally altered bifacial trimming flakes indicates that heat treatment may have been a process involved in the small amounts of tool manufacture and maintenance accomplished at the site. This further implies that the four thermally altered shaped tools, which represent a single category of fragmentary bifaces (see below), represent either manufacturing rejects, or breakage incurred in a resharpening process.

As a final observation on the thermal alteration of chert, eight chunks in the assemblage exhibit severe thermoclastic damage, evidenced by overall heat discoloration, and by the cracking and crazing of fracture surfaces. Two alternative interpretations of these pieces must be considered. On one hand, the specimens may represent angular waste accidentally or non-intentionally exposed to heat sources. On the other hand, exposure to heat may have been intentional, indicating use as hearthstones, or in connection with stone boiling. Instances of the latter alternative have been suggested at other sites in the El Dorado Lake area; however, in view of the small sample sizes, and the lack of contextual evidence, neither alternative can be evaluated at 14BU16.

Shaped Tools

The 11 shaped tools in the assemblage represent a range of postulated functional categories, as shown in Table 3.6.

Table 3.6. Functional categories and chert types of shaped tools, 14BU16.

Functional Category	Florence A	Florence B	Ind./ Misc.	Total
Projectile Points	1	-	1	2
Small Biface	-	1	-	1
"Light Duty" Bifaces	2	-	-	2
Biface Fragments	4	-	-	4
End Scrapers	1	1	-	2
Total	8	2	1	11

Two projectile points are present in the assemblage. One is a corner-notched, straight based point, fashioned from a triangular preform (Fig. 3.5b). Heat discoloration is most intense along one margin of the tool, gradually decreasing towards the opposite margin, which shows no discoloration. The point's tip shows evidence of reworking into a steep, planoclinal edge (edge angle 70°). The retouch resulted in the isolation of a small "nib" at the tip, possibly indicating the tool's use as a hafted perforator. In size and outline morphology, this point suggests a Plains Woodland cultural affiliation.

The second projectile point is a distal fragment of a small, triangular specimen (Fig. 3.5a). The margins of the tool are finely serrated. Only one face of the tool is worked. The surface opposite that illustrated represents the ventral surface of a small flake, with a remnant bulb of percussion visible at the tip. Similar points with serrated margins have previously been reported in the El Dorado Lake area from Plains Woodland components on 14BU9 (Leaf, Chapter 4, this volume) and 14BU19 (Fulmer 1976).

One small, triangular, unnotched biface of unheated Florence B chert was recovered (Fig. 3.5c). The specimen's base expands to form two small, wing-like projections, which, on close examination suggests that it represents the reworked base of an expanding stemmed projectile point such as those known to occur in Woodland and Plains Village assemblages in the El Dorado Lake area. The specimen's size (1.5 cm. in length) and the steepness of its working edges (edge angle 35-40^{o}) seem to preclude its use as a cutting tool. It is possible, based on the thickness of the tool and the distal convergence of its edges, that it represents a drill or perforator.

Two "light-duty" bifaces, both of unheated Florence B chert, are represented in the assemblage. The first is a distal end of an acuminate biface (not illustrated). The acuteness of the edge angle (30^{o}), and the thinness of the tool (maximum thickness 6 mm.), suggest that it would have served adequately as a cutting implement.

The second "light-duty" biface (Fig. 3.5f) was fashioned from a large flake of Florence A chert, and retains the planoconvex shape of the original blank, despite the fact that the ventral surface (not shown) is completely retouched. No remnant of the platform or the bulb of percussion remains; however, the dorsal surface exhibits remnant cortex. The working edge of the tool forms an arc, oriented transversely to the tool's long axis, and finely retouched to an edge angle of 30^{o} to 40^{o}. Edge rounding and small, scalar facets are macroscopically visible along the entire working edge, with the exception of a small portion of the edge centered on the tool's long axis. This area is crushed and step faceted, indicating more intensive wear. As illustrated, the left hand portion of the working edge has been completely removed, presumably due to an impact fracture whose origin is marked by a negative bulb of percussion at the point indicated by an arrow in the illustration. This fracture represents an impact fracture developed during use, or perhaps a failure which occurred during an attempt to sharpen the edge.

The use of the tool as an adze may be inferred from the restriction of retouch and wear to one surface of the working edge, characteristic of tools used in a transverse motion (Semenov 1964:21), and by the presence of step fractures, indicating that a hard material such as wood was worked (Tringham _et al_. 1974:189).

Four specimens represent fragments of bifaces fashioned from heat treated Florence A chert. Due to their small size, the outline of the pieces before breakage cannot be determined. The fracture surfaces on two specimens bear "pot lids", indicating that the fractures were thermally induced. The other two specimens exhibit characteristic features which

Purdy (1975:134-5) describes as "lateral snap", a form of breakage which can occur during manufacture or resharpening. The two specimens exhibiting lateral snap fractures also exhibit marginal wear in the form of macroscopically visible edge crushing. The thermally fractured specimens exhibit no such wear.

Two endscrapers from 14BU16 were made on expanding flakes of unheated chert, one of Florence A and the other of Florence B. The Florence A specimen (Fig. 3.5g) is triangular in outline. The ventral surface (not illustrated) is unflaked, except for reduction of the blank's bulb of percussion. Steep, subinvasive retouch is present on all three margins of the tool's dorsal surface, leaving the interior of the tool unworked. Heavy wear is evident on the transverse edge (edge angle 80°).

The second scraper (Fig. 3.5h) exhibits a planoconvex cross section. The ventral surface is unflaked, except for a small amount of bulbar reduction; the dorsal surface is completely flaked. The lateral margins, which converge toward the proximal end of the tool, are rounded, suggesting that the tool may have been hafted. The transverse edge is steeply retouched, and was probably sharpened numerous times in its uselife. Intensive utilization, evidenced by crushing and step faceting on the transverse edge (Fig. 3.5i), was severe enough to significantly undercut the tool's working edge.

Both scrapers exhibit heavy utilization in the form of step fractures. Experiments conducted by Tringham et al. (1974:189) demonstrates that such fractures are not produced by working "soft" materials such as hides or flesh, but rather result from the working of bone, antler, or wood. The nearly right angles formed by the working edges of the 14BU16 scrapers are interesting in light of ethnographic observations of Australian hunter-gatherers, who find steeply-angled edges well suited for shaving or planing wooden objects (Hayden 1977:185).

The single utilized alluvial cobble from the site (Fig. 3.6a) weighs 187.3 gm. and measures 97 mm. in length. The working edge, oriented transversely to the longitudinal axis, was formed by the removal of a few flakes to create a crude, biclinal edge. The edge shows heavy crushing, which, together with the edge orientation and the mass of the tool, suggests utilization in a heavy chopping function.

Thirteen flakes exhibit unambiguous utilization or retouch. Using combined criteria of working edge angle, working edge shape and working edge placement, these flakes were grouped into functional classes. Five are classified as cutting tools, two as scraping tools, and six as notches.

Of the five cutting tools, three exhibit intentional, retouched backing along one margin opposite a working edge. The working edge on all three flakes shows utilization but no retouch (Fig. 3.6b). No backing occurs on the other two cutting tools. Intentional backing also occurs on two of the six notches. As with the backed cutting tools, retouch seems to have served to blunt an edge to facilitate prehension.

One flake scraper and two notches were made on decortication flakes. On

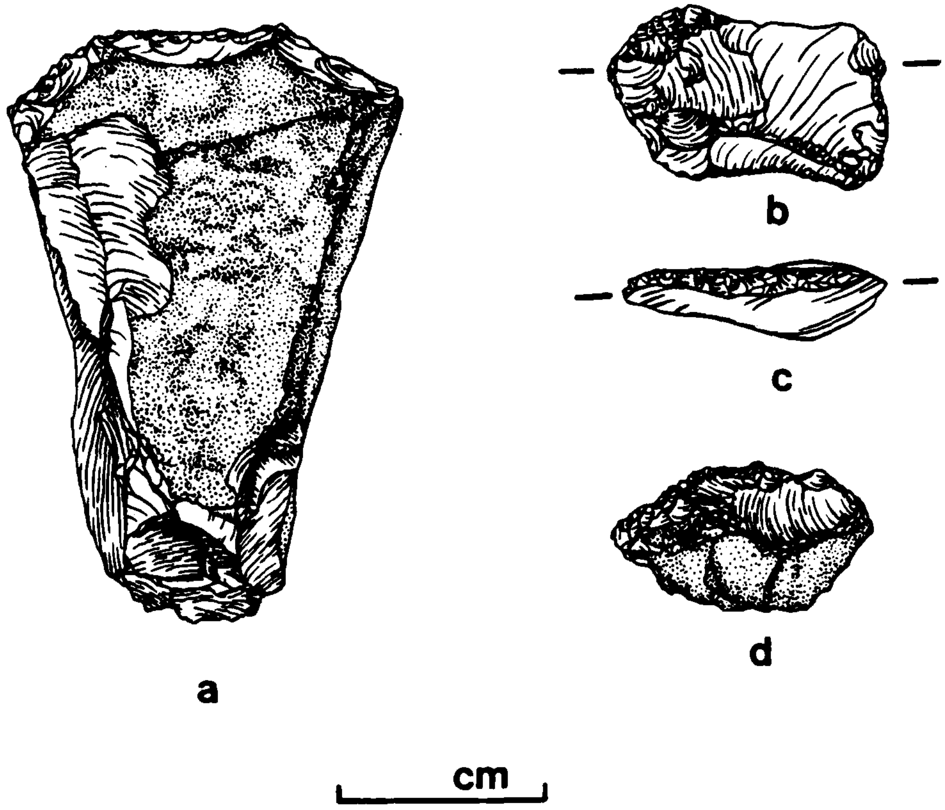

Figure 3.6. Other artifacts, 14BU16: (a) utilized cobble; (b,c) intentionally backed retouched flake, dorsal view and lateral view of backed edge; (d) naturally backed retouched flake.

all three flakes, the placement of the working edge in relation to the cortical surface suggests that the cortical surface served as a natural backing to facilitate prehension (Fig. 3.6a).

Discussion

Stylistic indicators suggest that the site be assigned to a Plains Woodland cultural affiliation. This interpretation differs from that offered by Eoff and Johnson (1968:28), who assigned the site a later, "Central Plains phase" affiliation. Their inference was based on the only "diagnostic" artifact then available from the site, the small, unnotched biface, illustrated here in Figure 3.5. As discussed above, a closer look at this artifact reveals that it is the reworked base of

a stemmed projectile point resembling those associated with Woodland as well as Plains Village occupations. The presence of a corner-notched projectile point and a small triangular point with serrated margins, both recovered during the 1978 investigations, suggest that a Woodland affiliation be accepted for the site.

The site's limited areal extent (.52 ha.) and the small quantity of surficial debris suggest that prehistoric occupation or occupations most likely consisted of temporary, ephemeral encampments of small groups of individuals. Hunting activities are indicated by the occurrence of projectile points, although the reworking of the tip of one point and the broken base of a second suggest that this class of tool also served secondary functions. Although a perforating or drilling function was posited for both reworked specimens, this functional assignment is best regarded as tentative.

The presence of an adze-like biface, two heavily utilized scrapers, and notched flakes indicates woodworking tasks, activities which might be considered complementary to hunting, if such tasks as the maintenance of projectile shafts and other wooden hunting implements are assumed. Cutting and chopping tasks are represented by a thin bifacial knife tip and (possibly) a cobble chopping tool, in addition to five retouched flakes for which a cutting function is inferred.

The processing of plant foods at 14BU16 is not well evidenced, although it is possible that the fragment of weathered chert represents part of a small grinding implement. It should also be noted that evidence for woodworking, discussed above, might apply equally to the manufacture and maintenance of implements such as digging sticks.

Ceramics are noticeably absent from this Plains Woodland assemblage. This may be indicative of the non-reliance on ceramic vessels as storage facilities or cooking implements, or alternatively, it might merely represent the poor preservation of ceramics on the site.

The procurement and initial reduction of raw materials was not a prevalent site activity. It was suggested previously that most chert was brought to the site in the form of previously trimmed cores, and that the primary goal of reduction of these cores may simply have been the provision of flakes for use in the performance of "ad hoc" tasks.

Little tool manufacture and maintenance was carried out on the site. Evidence of such activity is restricted primarily to six bifacial trimming flakes and four biface fragments which may (or may not) represent preforms. The general indication is that most tools used at the site, like cores, were brought to the site already fashioned, and ready to use. This inference seems to be compatible with the conceptualization of 14BU16 as a temporary encampment, where small groups carried out a variety of resource extraction activities, such as hunting and plant processing.

A final observation concerning the nature of the site's occupation concerns its topographic placement. Located on the slope of a high natural terrace, the site would have been well protected from floods of spring and

early summer, which might have increased its attractiveness as an occupational loci at that time of year. Although the hypothesis is not testable with the archeological data at hand, it might be considered in future analyses of prehistoric settlement behavior in the El Dorado Lake area.

Recommendations

In the winter Of 1978, after the completion of excavations at 14BU16, and the partial analysis of the recovered assemblages, it was determined that no further investigations were required to mitigate the impact of construction activities on the site. These activities, in 1979, completely destroyed the site. Continued revisits to the site in the summer, fall, and winter of 1978 yielded little cultural debris, suggesting that, in those portions of the site having adequate surface visibility, a nearly complete recovery of cultural debris was achieved. Further testing or large scale excavation would not have been warranted, since the cultural deposits had been severely impacted by soil erosion and terrace construction.

14BU81

Physical Description

Site 14BU81 lies on the Walnut River floodplain, 730 m. northeast of the river's confluence with Durechen Creek, and about 400 m. east of the river itself. Topographic relief in the site's immediate vicinity is low, the total variation in elevation exhibited on the site map (Fig. 3.7) being limited to 50 cm. This surface slopes gently from northwest to southeast across the site, and is crosscut by broad, shallow swales oriented transversely to the slope. The prehistoric surface scatter is almost completely contained within the largest of these swale-like features, the significance of which is discussed below.

A fence row crossing the site from north to south is elevated about 25 cm. above the adjacent ground surface atop a narrow ridge (Fig. 3.7). This indicates that as much as 25 cm. of soil has been eroded from portions of the site, probably as a result of cultivation in historic times.

A buried oil pipeline, owned by the Mobil Oil Company, crosses the site from northeast to southwest. Although no observable topographic disconformity resulted from this construction, the pipeline's course can be determined by extrapolation from the line's intersection with the fence row, marked by painted posts, to another set of marker posts located northeast of the site. The line's path can also be traced by the complete absence of prehistoric cultural debris within 5 m. of its presumed course.

Based on conversations with field men from the Mobil Oil Company and on observations of other pipeline excavations in the area, the trench required for the pipeline was relatively small, perhaps 50 cm. wide and 1 m. deep. However, excavating the trench and laying the pipe involved operating

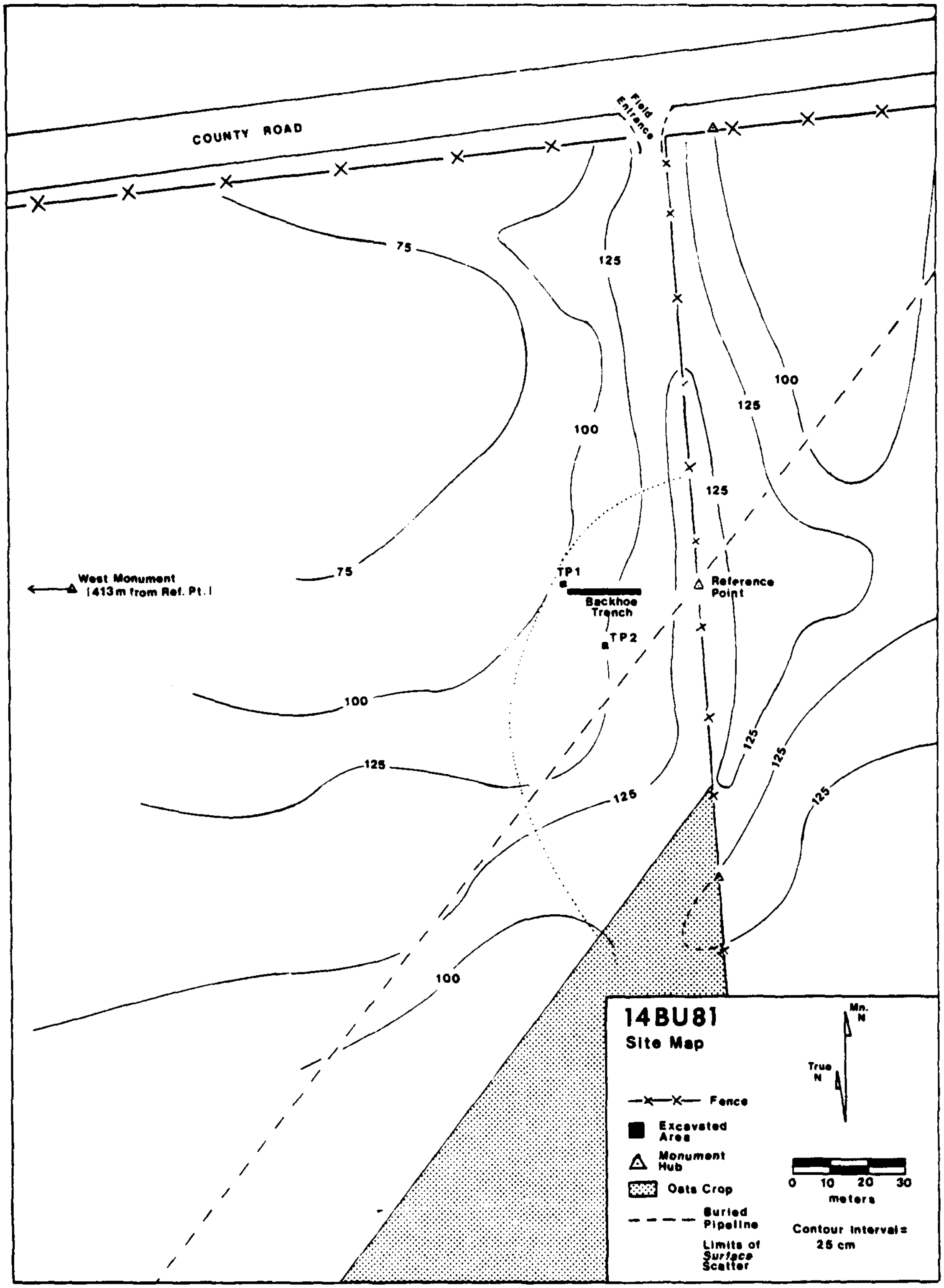

Figure 3.7. Topographic map of 14BU81. Contours in cm. below an arbitrary datum.

equipment and piling backdirt over a wide strip on either side of the actual trench. At 14BU81, it is this activity which accounts for the absence of prehistoric surficial debris within 5 m. of the buried line. With the exception of this surficial disturbance, pipeline construction is not believed to have extensively impacted the site.

Archeological Investigations

The purpose of the initial 1978 reconnaissance of 14BU81 was to determine the site's proximity to areas impacted by the relocation of the Atchinson, Topeka and Santa Fe railroad, construction of which began later that summer. All three known prehistoric sites in the vicinity of the impact area (14BU19, 14BU20, and 14BU81) were visted, but none was found to be directly endangered. Although the relocation route lay 550 m. north of 14BU81, posing no threat to the site, a proposed borrowing area associated with the relocation lay within 150 m. of the site, immediately north of the section road illustrated in Figure 3.7. Since it was felt that the site might be indirectly threatened by heavy equipment operation in areas adjacent to the borrow pit, the decision was made to test 14BU81. This decision was also influenced by our initial surface reconnaissance of the site, which indicated a dense concentration of surface debris, including a large number of bifacial tools and projectile points suggesting an Archaic cultural affiliation.

Recorded by University of Kansas personnel in 1975, and revisited in 1977, little was known of 14BU81 prior to the investigation reported here. A small sample of debitage was recovered from the site in 1975, while the 1977 visit was frustrated by dense weed cover (Root 1978:24). When the site was visited in 1978, the land had been returned to cultivation. As indicated in Figure 3.7, site boundaries were most clearly delimited in the northwestern portion of the site, where recent rains and freshly-tilled soil resulted in optimal surface visibility. East of the fence row, visibility was somewhat restricted by the presence of a knee-high milo crop. Although surface debris was found in this area, it was not possible to confidently determine site boundaries. The southeastern portion of the field supported a ripening oat crop. Ground visibility beneath this crop was 0%, and no intensive surface reconnaissance was carried out.

In the freshly tilled portion of the site, surface scatter covered about .53 ha.(5300 $m.^2$). Had surface visibility conditions permitted a more complete determination of the extent of cultural debris in other parts of the site, it is probable that the delimited area would have at least doubled. Thus, the total areal extent of surface scatter at 14BU81 is at least 1 ha.

Horizontal provenience at 14BU81 was calculated from an on-site reference point, located in the fence row directly above the pipeline. Three monument hubs were placed off-site and their distances and bearings from the reference point recorded, as shown on the site map. The west monument was located in the treeline of the Walnut River, 413 m. west of the site reference point. The north monument was located in the

fence line bordering the section road. Because the line of sight from the reference point due north to this fence line was obscured by vegetation, the north monument was placed 122.4 m. due north of an auxiliary reference point located 5 m. due east of the actual reference point. From this same point, a location for the south monument was determined, 75.6 m. due south, in the north-south fence line.

Test excavation of the site was accomplished in two test squares and a 20 m. backhoe trench, located as shown in Figure 3.7. Test Pit 1 located 35 m. west of the reference point, was excavated in all four 1 by 1 m. quadrants to a depth of 60 cm. At this depth, a decrease in artifact density and a change in natural stratigraphy indicated that the base of the cultural stratum had been reached. For this reason, further excavations in TP 1 were conducted only in the SE and NE quadrants, which were dug to a depth of 1 m. BS. Although a slight increase in artifact density was noted in the lower levels of TP 1, excavation was curtailed and efforts concentrated on the more extensive archeological deposits of TP 2.

Test Pit 2 was located 25 m. west and 15 m. south of the reference point, 10 m. from the pipeline, and well within the surface scatter. Situated approximately 20 m. from TP 1, TP 2 was 20 cm. lower in vertical elevation (Fig. 3.7). At the time work ended in TP 1, TP 2 had been excavated to 40 cm. BS. The large quantity of cultural debris, including abundant charcoal flecks and burned earth, indicated that an intact sub-plowzone deposit was present, and excavation was continued to 70 cm. BS in all four quadrants. Both the density of cultural debris and the intensity of anthrosol development decreased below 50 cm., and at 70 cm., it was determined that the cultural deposit had been penetrated.

At this point, a soil auger was used to investigate the unexcavated sediments beneath both test pits. The auger test in TP 1 revealed no changes in natural stratigraphy to a depth of 2.0 m., and no cultural material was encountered. However, the auger test in the SW quadrant of TP 2 encountered a concentration of chert at a depth of between 135 and 150 cm. The SW quadrant of TP 2 was subsequently excavated to 130 cm. to reach this buried deposit. The 60-70 and the 70-80 cm. levels yielded little cultural debris, and thus, two more levels, 80-100 BS and 100-130 BS were excavated rapidly. Excavation was then extended to 160 cm. BS in three 10 cm. levels, and in these levels, a dense concentration of chert chipping debris was encountered. To further expose this buried deposit, and in hopes of recovering datable organics or diagnostic artifacts, the SE, NE, and NW quadrants of the sqaure were rapidly excavated from 60 to 130 cm. Excavations were then extended more carefully from 130 to 150 cm. in two 10 cm. levels.

Although excavations in TP 2 were continued to 160 cm., the level between 150 and 160 cm. was essentially devoid of cultural materials, and excavations in TP 2 were therefore curtailed.

As mentioned above, a slight increase in the density of cultural material was noted in the lower levels of Test Pit 1. That this increase indicated the presence of a buried archeological deposit was confirmed by the excavation of a 20 m. long backhoe trench along the 500N baseline, exposing a thin

lense of chert flakes along a four meter section of the wall, between 6 and 10 m. from the SE corner of TP 1. The 12 flakes, individually plotted, ranged in depth from 94 to 136 cm. BS with a mean depth of 105 cm. (Fig. 3.8). Although the discovery of these materials in the backhoe trench confirmed the presence of a buried deposit in TP 1, there was not time to resume excavations. Given the comparatively low density of artifacts in the lower levels of TP 1 and the backhoe trench, it is relatively certain that no concentration of occupational debris comparable to that recovered from TP 2 was present.

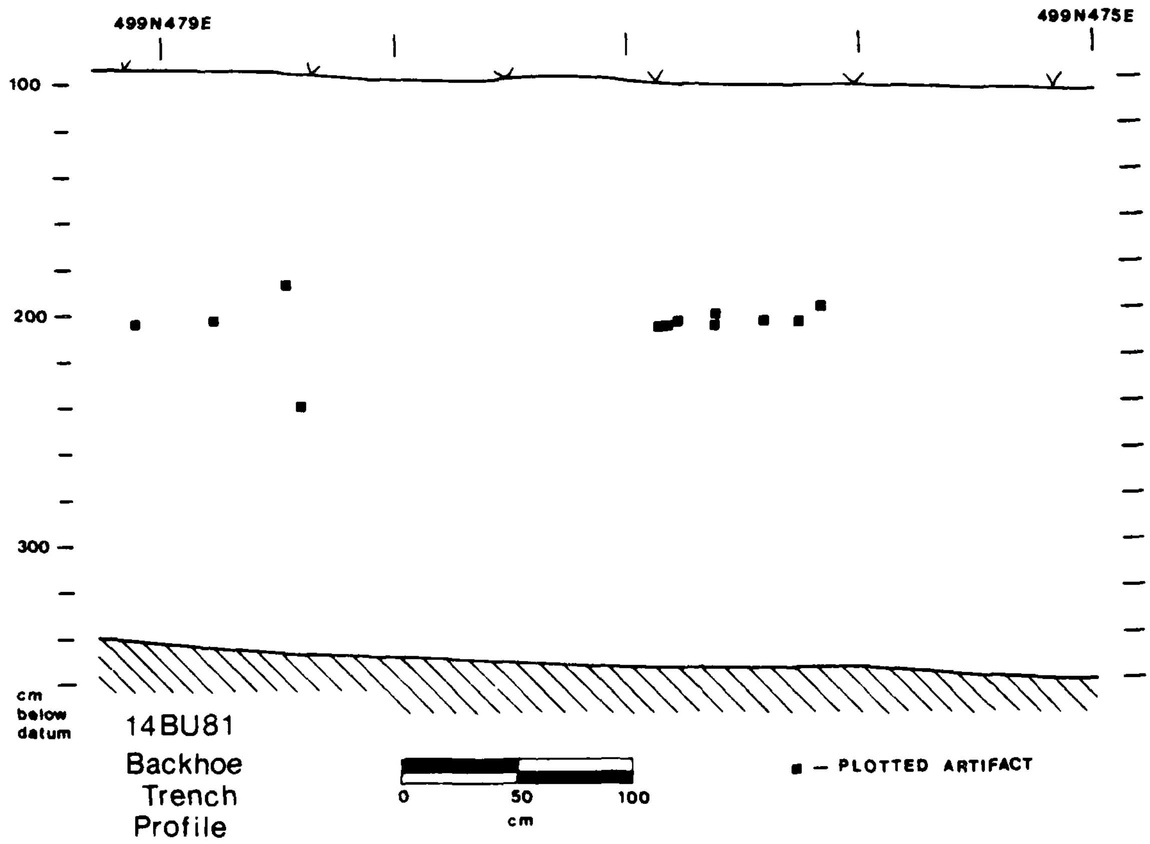

Figure 3.8. Profile of 4 m. section of backhoe trench on 14BU81, showing location of plotted flakes from Unit II.

Natural Stratigraphy

The profiles from the two test squares (Figs. 3.9 and 3.10) reveal two stratigraphic units at 14BU81: a dark, silty clay loam Unit I and a lighter colored Unit II. The upper 18 to 20 cm. of Unit I in both profiles is a loose, silty clay loam plowzone, containing abundant plant debris. When moist, the plowzone soil is very dark grayish-brown (10YR 3/2). In TP 1, Unit 1 extended to a depth of between 40 and 60 cm., while, in TP 2, it was somewhat deeper, extending to between 55 and 65 cm. BS. These sediments were a dark brown silty clay loam (7.5YR 4/2 to 7.5YR 3/2). During excavation, mottling was evident below 40 cm., indicating a gradual transition to the underlying Unit II sediment.

Unit II was noticeably lighter in color than Unit I, and appeared to be more plastic and clayey, as judged by the tendency of the sediments to ball up in the excavator's screens. However, when moistened between the fingers, the sediments evinced a "floury" texture, indicating an appreciable silt content.

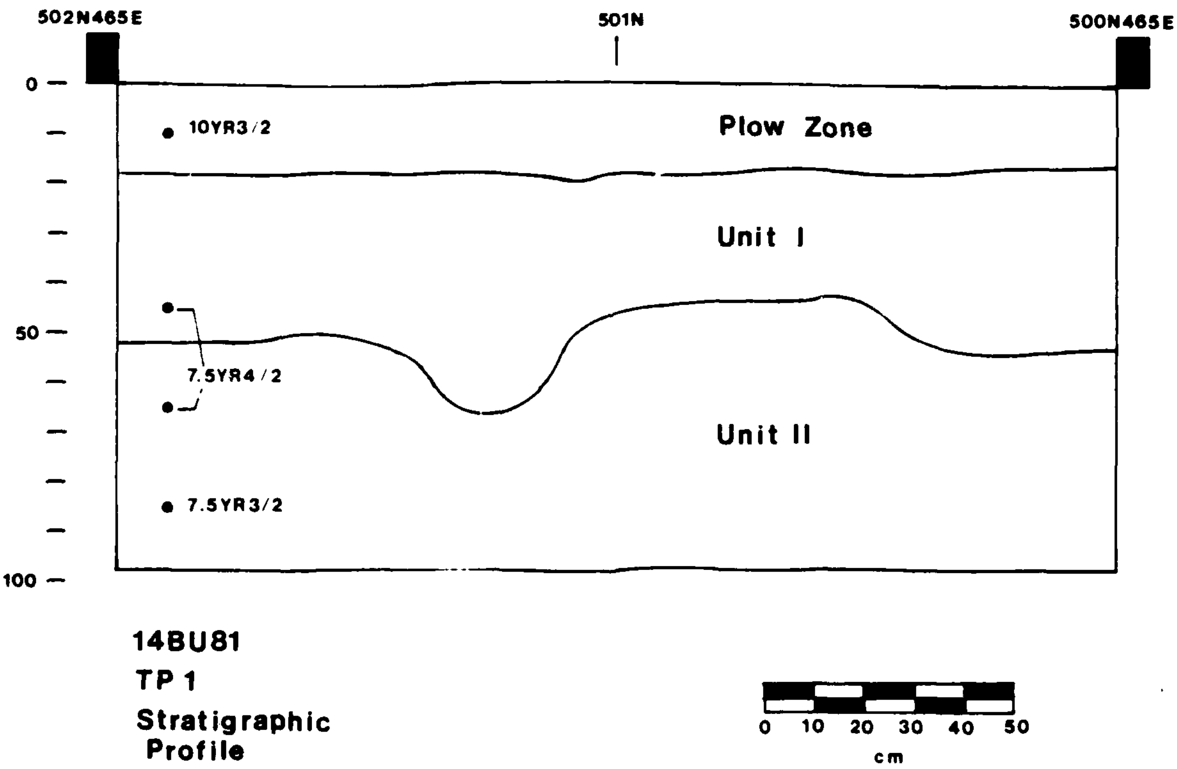

Figure 3.9. Stratigraphic profile of TP 1, 14BU81.

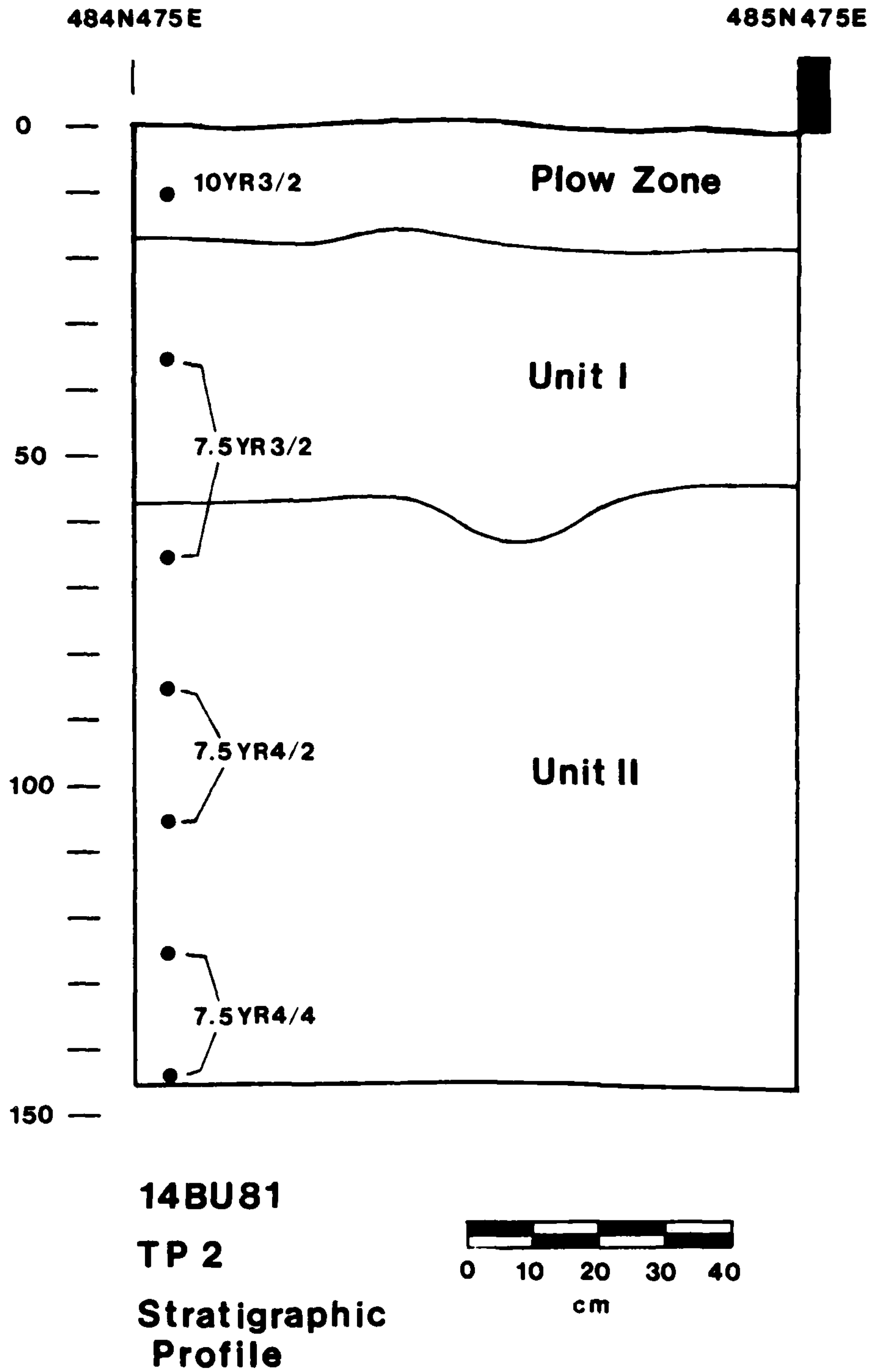

Figure 3.10. Stratigraphic profile of TP 2, 14BU81.

The profiles described above are similar to those of Brewer soils, the series within which the county soil survey (U.S.D.A. 1975) map the site. Unit I, in its thickness, textural characteristics, and color, corresponds to the silty clay loam A1 and B1 horizons of the Brewer soils. Unit II is comparable to the silty clay B2t and C1 horizons, although redder in color than the typical lower horizons of Brewer soils described by the soil survey (U.S.D.A. 1975:7-8).

In the upper Walnut River valley, Brewer soils occur most frequently in narrow, low lying areas paralleling the valley edges. Less frequently, Brewer soils occur in the middle of the floodplain, where they are mapped as elongated, sinuous masses, contained within broad areas of Verdigris soils, the major floodplain series (U.A.D.A. 1975, map 29). Brewer and Verdigris soils are differentiated primarily by the finer textures or the former (U.S.D.A. 1975:8). The sinuous shapes of the floodplain Brewer soil bodies suggest that these possibly represent abandoned stream channels. It would appear that 14BU81 is completely contained within such an area of Brewer soils.

Cultural Stratigraphy

Tables 3.7 and 3.8 show the number of artifacts recovered from each

Table 3.7. Vertical distribution of artifacts, TP 1, 14BU81.

	QUADRANTS					
Levels	SW	SE	NE	NW	Total	Artifact Density Index
00-20	4	4	6	4	18	2
20-30	4	1	1	1	7	2
30-40	2	5	3	4	14	4
40-50	7	0	6	1	14	4
50-60	0	3	4	1	8	2
60-70	-	4	5	-	9	5
70-80	-	5	13	-	18	9
80-90	-	3	8	-	11	6
90-100	-	16	18	-	34	17

Table 3.8. Vertical distribution of artifacts, TP 2, 14BU81.

Levels	SW	SE	NE	NW	Total	Artifact Density Index
	QUADRANTS					
00-20	45	57	50	46	198	25
20-30	24	19	58	22	123	31
30-40	14	10	18	15	57	14
40-50	2	7	8	5	22	6
50-60	4	11	0	7	22	6
60-70	7	-	-	-	7	7
70-80	5	-	-	-	5	5
80-100	5	-	-	-	5	3
100-130	32	-	-	-	32	11
130-140	191	-	186	-	377	>50
140-150	787	-	789	-	1576	>50
150-160	12	-	-	-	-	12

subsurface excavation level in the two test pits at 14BU81. There are discernible modes in the vertical distribution, indicating levels at which the highest concentrations of cultural material occurred. These modes are best demonstrated by the calculation of an index of artifact density, accounting for the varying thickness of excavated levels. The index is derived by dividing the total number of artifacts per level by the number of 1 m. by 1 m. by .10 m. volumes of sediment contained within that level. Thus, for levels 10 cm. in thickness, the total number of artifacts recovered from the 2 m.^{2} unit was divided by the number of one meter quadrants excavated. For the 20 cm. thick plowzone levels, the totals were divided by twice the number of quadrants, since each quadrant contains two units, 10 cm. thick. Since, in the context of artifact counts, fractions would be meaningless, the actual indices were rounded to the nearest whole number.

The density indices thus obtained (Tables 3.7 and 3.8) are presented graphically in Figure 3.11. In addition to the distributional data from

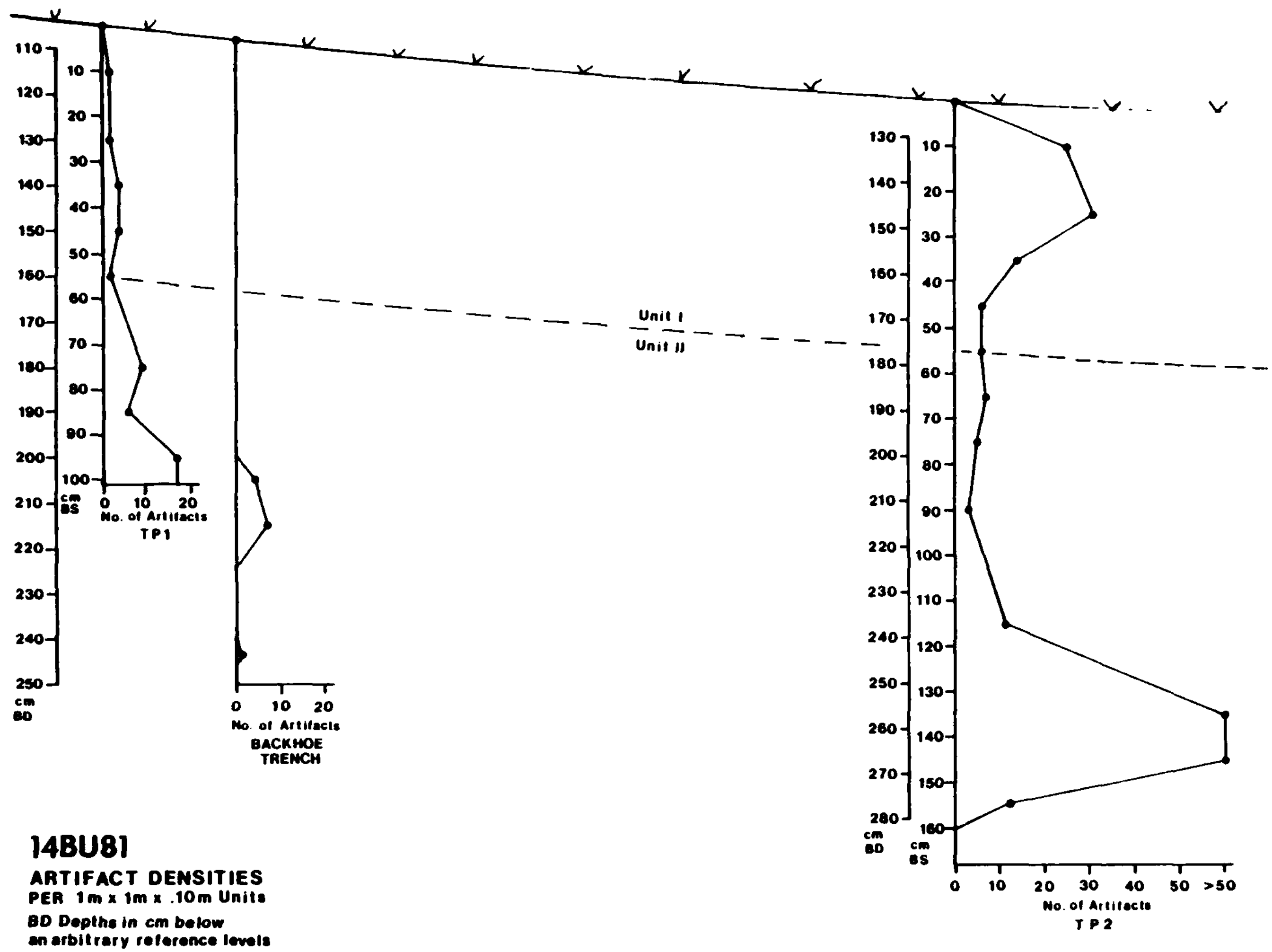

Figure 3.11. Cultural stratigraphy of 14BU81, as revealed by frequency distributions of artifact density indices.

the test pits, materials recovered from the backhoe trench are also plotted in the figure. To show the relationship of cultural stratigraphy to the natural stratigraphic units, the artifact distributions are drawn with reference to the site's arbitrary reference level and stratigraphic units.

A clear bimodality is evidenced in the vertical distribution of artifacts at the site. In TP 2, an upper component is marked by a modal density occurring between 20 and 30 cm. BS, while a second, much denser concentration occurs between 130 and 150 cm. In TP 1, although the overall sparsity of cultural material makes trends in the distribution difficult to define, an upper modal density is suggested between 30 and 50 cm. BS. A somewhat stronger mode is present at the 90-100 cm. level, and seems to represent the same cultural residue observed in the backhoe trench at an equivalent depth.

The stratigraphic separation of upper and lower components is supported by the presence, in Unit 1, of an anthrosol, or soil formed under the influence of human occupation. The anthrosol was noted in the course of excavation as an abundance of burned earth and charcoal particles contained in the artifact-bearing deposits. In Test Pit 2, where these particles were most abundant, burned earth and charcoal were present from the plow-zone to a depth of 70 cm. BS. In TP 1, burning was evidenced only to a depth of 60 cm., and was much less concentrated at all levels than in TP 2.

The data presented above demonstrate the presence of at least two components on 14BU81. In each test pit, the upper and lower components may be discriminated by the vertical distribution of artifacts. In addition, the occurrence of burned earth and charcoal coincides with the upper component's artifact distribution, further defining the subsurface limits of the Unit I cultural deposit.

Depositional Environments

The limited data available suggest that considerable geomorphic change has occurred over time at the site. From Figure 3.11, it is apparent that the present day ground surface between TP 1 and TP 2 forms a gentle slope. A similar sloping surface is not evidenced by the uppermost modal artifact densities, which occur in both test squares between 140 and 150 cm. below the site's reference level. This indicates that the Unit I occupations took place on a level land surface, sufficiently stable to permit the accumulation of a relatively thick cultural deposit. Identification of stratigraphic Unit I as the upper horizons of a soil provides further evidence for stability of the occupational surface, since soil development requires considerable time and stable depositional conditions.

The slope of the present day surface must then be attributed to processes post-dating prehistoric occupation of the site. Based on the anomalous elevation of the fence row crossing the site, approximately 25 cm. of soil has been eroded from the site, probably as a result of historic cultivation. This amount is roughly equivalent to the 20 cm. disparity in the elevation of TP 1 and TP 2, and suggests that the broad swale-like depression on whose northern slope the test pits were located is in part an erosional

feature.

In contrast to the modal artifact densities from the site's upper component, there is a 20 to 30 cm. disparity in below datum depths of the Unit II occupations in TP 1 and TP 2 (Fig. 3.11). In TP 1, and in the nearby backhoe trench, a lower component was identified at about 1.0 m. BS (about 2.4 m. BD), while in TP 2, a lower component is present between 1.30 and 1.50 BS (about 2.5 to 2.7 m. BD).

Two alternative explanations of this difference might be offered. Either two components, vertically and horizontally distinct, are represented at the site, of a single component occupying a sloping surface is indicated. Unfortunately, no diagnostic artifacts, crossmends of broken artifacts, or direct stratigraphic evidence relating the buried occupation of TP 1 with that of TP 2 were recovered. However, the second alternative is supported by the demonstrable homogeneity of the assemblages recovered from Unit II, both in the test pits, and in the backhoe trench (see Artifact Analyses below). If the second alternative were accepted, a leveling of topography between the times of the Unit II and Unit I occupations, is indicated.

In addition, there is evidence that the Unit II residues accumulated in a depositional environment different from that of the upper component of the site. In contrast to the slow aggradation of sediments postulated for Unit I, a rapid accumulation of sediments is suggested for Unit II. In TP 2, the lower component is tightly defined between 130 and 150 cm. BS. Although the base of the lower component in TP 1 was not detected, the thin lense of cultural debris in the backhoe trench exposure was primarily confined to a vertical range of 12 cm. The stratigraphic integrity of these cultural deposits suggests that they were sealed from disturbance soon after deposition by a rapid accumulation of sediments. Such a process is definitely not indicated by the diffuse distribution of artifacts in Unit I. Thus, a lowering of rates of sedimentation through time may be inferred.

To summarize, at 14BU81 there is evidence for a decrease through time in the rates of sedimentation, concurrent with a change in topography from a sloping surface in Unit II to a level surface in Unit I. Previously, it was observed that the surface scatter at 14BU81 was contained within a broad swale, which seems to be contiguous with a body of Brewer soils. The shape of this soil body suggests that an abandoned stream channel, presumably of the Walnut River, may be represented. Such an interpretation is consistent with the stratigraphic considerations presented above. Both the gradual reduction in rates of sedimentation and the leveling of land surfaces are processes which would be expected to occur in an aggrading channel fill deposit (Allen 1965). The possibility that 14BU81 exemplifies the prehistoric occupation of such a feature is intriguing, in view of a similar occupational situation identified by Schmits (1978) at the Coffey site in northeastern Kansas. However, further evaluation of the sedimentary deposits at 14BU81 are required before conclusive statements can be made.

Relative Dating

Although charcoal was present as small flecks throughout the Unit I

deposits in both test squares at 14BU81, the samples collected were of insufficient quality or quantity for radiocarbon assay. Even less charcoal was present in the Unit II occupation levels. Thus, the primary means for dating the occupations is inter-site comparison of projectile point morphology. To this end, 14BU81's 13 projectile points are compared with those recovered from radiocarbon dated strata at the Snyder site, 14BU9, located 5 km. south of 14BU81 (Leaf, Chapter 4, this volume). At this site, Grosser, (1973) identified four stratigraphically superimposed, stylistically homogeneous series of projectile points, on the basis of which cultural stratigraphic units, or "phases", were defined. The purpose of the comparisons made below is strictly chronological, seeking to correlate the occupational residues at 14BU81 with radiocarbon dated strata at Snyder.

Although, undoubtedly, artifacts from 14BU81 bear morphological similarities with those from numerous other sites, it is not the purpose of this section to discuss such comparisons.

From Unit I at 14BU81, seven complete specimens and two basal fragments of relatively large, stemmed projectile points were recovered. These points vary in morphology from relatively long, lanceolate forms (Fig. 3.12b,c) to shorter, triangular bladed forms (Fig. 3.12a,d). Eleven of these points were recovered from the site surface, while one (Fig. 3.12b) occurred at 46 cm. BS in TP 1, and another (Fig. 3.12a) at 15 cm. BS in TP 2. At the Snyder site, Grosser (1973:233) associates similar stemmed projectile points with the El Dorado phase Archaic. The four radiocarbon dates from the El Dorado phase levels of Snyder range from 3240 ± 140 B.P. to 3980 ± 100 B.P. (1290 - 2030 B.C.) (Leaf 1979:10).

A second group of points from 14BU81 consists of three small, notched specimens. Two of these are corner-notched (Fig. 3.12e,f), and one is side-notched (not illustrated). In their small size and notching characteristics, these specimens are comparable to points which Grosser (1973:232) placed within the Walnut phase , an Archaic occupation associated with two radiocarbon dates of 1970 ± 110 and 2060 ± 80 B.P. (20 and 110 B.C.) (Leaf 1979:10). All three notched points from 14BU81 are from the site surface.

A fourth notched point, (Fig. 1.21e), recovered from the site surface, is considerably smaller than those discussed above, although it falls within the size range of Walnut phase corner-notched points at Snyder (Grosser 1970:100, 1973:232). Based on data provided by Grosser (1979:49, 100), the Walnut phase corner-notched points may be distinguished from similiar Woodland points by neck width. While neck widths of Woodland points vary from 3 to 6 mm., with a mean of 4.9 mm., neck widths of Walnut phase points vary from 7 to 11 mm., with a mean of 8.5 mm. The neck width of the projectile point discussed here, 9.5 mm., is within the range of Archaic points, but well beyond that of the Woodland. Thus, it may be that this point is associated with 14BU81's Late Archaic occupations.

The cultural affiliation of a single distal point fragment (Fig. 3.12g), recovered from the surface of 14BU81, cannot be ascertained. The fragment is small, and could easily represent an isosceles triangle point style often associated with Woodland occupations in the El Dorado Lake area, including the Woodland levels of the Snyder site (Grosser 1973:232; Leaf, Chapter 4, this volume). Just as easily, however, it could represent the distal end of

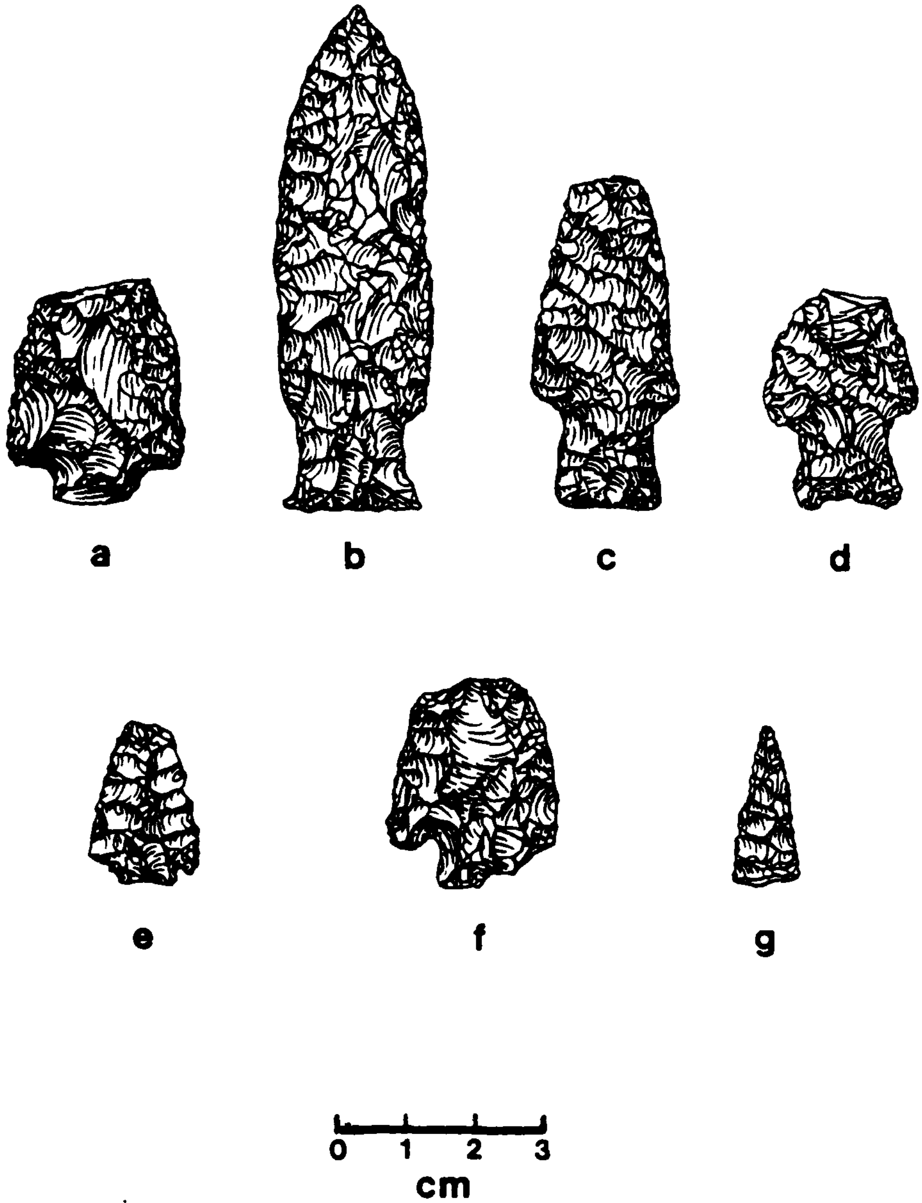

Figure 3.12. Projectile points from 14BU81: (a-d) stemmed projectile points; (e-f) corner-notched projectile points; (g) distal fragment of isosceles triangular point.

a long, narrow lanceolate point such as those recovered from El Dorado phase deposits at the Snyder site.

Based on radiocarbon dates from the Snyder site, the Unit I Archaic occupations probably occurred sometime between approximately 2000 and 4000 B.P. Although a mixture of stemmed and notched points, representing stylistic indicators of both the El Dorado and Walnut phases, occur on the site surface, only stemmed El Dorado phase points were recovered below the surface. Therefore, it is suggested that the sub-plowzone portions of Unit I represent an intact deposit of El Dorado phase Late Archaic.

Since no dateable organics or diagnostic artifacts were recovered from the Unit II cultural deposits, there is no direct evidence for dating these materials. However, a similar, dense concentration of chipping debris is present at 14BU4, located 5 km. south of 14BU81, near the Snyder site. On the basis of projectile point comparisons and stratigraphic considerations, Fulmer (1976:91) assigned 14BU4's lower component to the Chelsea phase Archaic, the lowermost cultural-stratigraphic unit identified by Grosser (1973) at 14BU9. Although the lower component of 14BU4 and the Unit II occupations of 14BU81 bear a functional resemblance to one another, this is not considered sufficient evidence for inferring contemporaneity.

At 14BU4, the Chelsea deposit was encountered between 90 and 135 cm. BS (Fulmer 1976:46); at 14BU9, Chelsea materials were identified between 140 and 190 cm. BS (Grosser 1973:235). The Unit II occupation at 14BU81 lies at equivalent depths of 130-150 cm. BS in TP 2, and 90-120 cm. BS in TP 1 and the backhoe trench. But, again, a simple equivalency of below surface depths is not a sufficient argument for contemporaneity. At 14BU9, Grosser (1970, 1973) mentions no stratigraphic disconformity between the Chelsea phase and the immediately overlying El Dorado phase levels. At 14BU81, however, the Unit II occupations are separated from the overlying El Dorado phase occupations of Unit I by 50 to 100 cm. of low-density deposit. To establish a Chelsea phase affiliation for the Unit II occupations at 14BU81, it is necessary to account for the differences in depositional conditions between the Snyder site and 14BU81. With the data presently available, such an account is not possible. Further archeological and geomorphological research is necessary to postulate the culture-historical placement of the Unit II occupations. For the present, it is possible only to postulate a pre-El Dorado phase age for the deposit.

Artifact Analysis

The distribution of artifacts among provenience units, raw material, and technological classes is presented in Table 3.9. In the present analysis, the collection is partitioned into two assemblages, corresponding to the site's upper (Unit I) and lower (Unit II) components. Since all excavated levels yielded artifacts, precluding specification of precise cut-off points between the two components, arbitrary cut-off points have been selected. The boundaries as defined here are intended to isolate for analysis the densest, and presumably most intact, cultural residues, excluding from analysis artifacts from the ambiguous, intervening levels.

Table 3.9. Raw material categories and chipped stone technoclasses observed among provenience units, 14BU81.

					Chipped Stone									
Provenience	Tested Raw Material	Cores	Cortical Chunks	Decortication Flakes	Intermediate Flakes	Noncortical Chunks	Bifacial Trimming Flakes	Shaped Tools	Thermoclastic Shatter	Weathered Chert	Fauna	Limestone	Sandstone	Total Artifacts
Grab Surface Collection	6	2	9	34	541	24	26	59	9	9	11	24	1	755
TP 1														
00-20	-	-	-	2	9	2	-	-	-	2	1	3	1	20
20-30	-	-	-	-	7	-	-	-	-	-	-	-	-	7
30-40	-	-	-	2	10	1	-	-	1	-	-	-	-	14
40-50	-	-	-	3	8	-	2	1	-	-	-	-	-	14
50-60	-	-	1	-	7	-	-	-	-	-	-	-	-	8
60-70	-	-	-	2	-	-	2	-	-	-	-	-	-	4
70-80	-	-	-	-	14	-	4	-	-	-	-	-	-	18
80-90	-	-	-	-	11	-	-	-	-	-	-	-	-	11
90-100	-	-	-	3	31	-	-	-	-	-	-	-	-	34
TP 2														
00-20	-	-	-	8	163	-	7	3	-	11	-	1	4	197
20-30	-	-	3	10	97	2	7	3	-	1	-	-	-	123
30-40	-	-	-	2	48	-	4	1	1	1	-	-	-	57
40-50	-	-	-	1	18	-	1	1	-	1	-	-	-	22
50-60	-	-	-	1	21	-	-	-	-	-	-	-	-	22
60-70	-	-	-	-	7	-	-	-	-	-	-	-	-	7
70-80	-	-	-	-	5	-	-	-	-	-	-	-	-	5
80-100	-	-	-	-	5	-	-	-	-	-	-	-	-	5
100-130	-	-	-	-	31	-	-	-	-	-	-	-	-	31
130-140	-	-	-	17	361	-	-	-	-	-	-	-	-	378
140-150	-	-	-	69	1507	-	-	4	-	-	46	-	-	1626

The Unit II assemblage consists of all materials recovered between 130 and 150 cm. BS in TP 2 and below 90 cm. in TP 1. Analysis of the Unit I assemblage is complicated by the fact that the site's surface collection contains stylistic indicators of two temporally and culturally distinct Archaic phases. By contrast, stylistic indicators from the Unit I subsurface deposits represent only one cultural unit, the El Dorado phase, suggesting that the Unit I excavated materials may represent a culturally homogenous unit. To seek evidence supporting this possibility, surface and subsurface materials are here treated separately. The excavated Unit I assemblage includes materials from the upper 50 cm. of TP 1 and the upper 60 cm. of TP 2, depths which coincide roughly with the base of stratigraphic Unit I and the subsurface depth beneath which artifact densities declined.

Unit I Surface Assemblage

The 14BU81 surface assemblage totals 755 specimens, of which 710 are chipped stone. Quartzite, sandstone, weathered chert, bone, and limestone make up the remainder of the assemblage, in proportions shown in Table 3.9.

Of the 24 pieces of limestone, only one exhibits the reddish discoloration attributed to burning. No evidence of exposure to heat is noted on the remaining specimens. Although they may have served some function in the aboriginal occupation of the site, that function cannot be demonstrated with present data.

Two fragments of mollusc shell and nine fragments of calcined bone were recovered from the site surface. Calcining, a characteristic condition of burned bone, indicates that the bone is part of the prehistoric cultural deposit. Because of the small size of the fragments, taxonomic identification is not possible.

One of the two mollusc shell fragments may be considered a recent intrusion, since the shell's outer surface possesses the thin, non-mineral epidermis, or periostracum. This epidermis decays rapidly following the organism's death, and would not be expected to occur on a shell exposed to extensive natural weathering. The small size of the second shell fragment precludes determination of its origin.

Nine specimens of weathered chert, described in Table 3.10, were recovered from the site surface. The two largest specimens (Table 3.10, A,B) are ellipsoidal in shape, one end of the ellipsoid being truncated in a flat surface. Since all surfaces of the stone are equally weathered, the flat truncation surface is considered a natural feature. The flat surface of specimen A bears a shallow pit approximately 2.8 cm. in diameter, suggesting the artifact's function in activities such as nut processing. No pit is present on the second ellipsoidal piece (Table 3.10B), the truncated surface of which is markedly convex. The object's shape and size are within the range of hand prehension, suggesting its use as a mano in grinding or pulverizing tasks.

Table 3.10. Data on weathered chert artifacts, 14BU81 surface.

Specimen Label[a]	Weight[b]	Max. Dimension[c]	Thermal Alteration[d]	Shape Description
A	1579	14.8	-	Truncated ellipsoid, pitted
B	532	9.0	-	Truncated ellipsoid, convex
C	289	8.7	-	Truncated ellipsoid, pitted
D	160	8.9	-	Smooth, plane surface
E	85	6.9	-	Smooth, plane surface
F	59	5.7	+	Non-smooth, rounded surface
G	23	3.6	+	Non-smooth, rounded surface
H	34	4.4	+	Angular, interior fragment
I	18	4.0	+	Angular, interior fragment

[a]referenced in text; [b]in gm.; [c]in cm.; [d]+=present, -=absent

The third weathered chert specimen (Table 3.10C; Fig. 3.13) is a wedge-shaped fragment of a truncated ellipsoid like those described above. The base of the wedge represents the ellipsoid's truncated surface, while the rounded side represents the piece's original outer surface. The third side is a fracture surface, exhibiting a pronounced bulb of percussion. The specimen was detached from its object piece by a blow directed at a shallow pit, 35 cm. wide and 5 cm. deep, on the truncation surface. This suggests that the specimen was broken during utilization in an activity such as nut processing.

Two weathered chert artifacts (Table 3.10 D,E) exhibit smooth, plane surfaces suggesting their use in grinding or pulverizing tasks. As neither specimen is complete, it is not possible to suggest their original size, or whether they were hand held or used as metates.

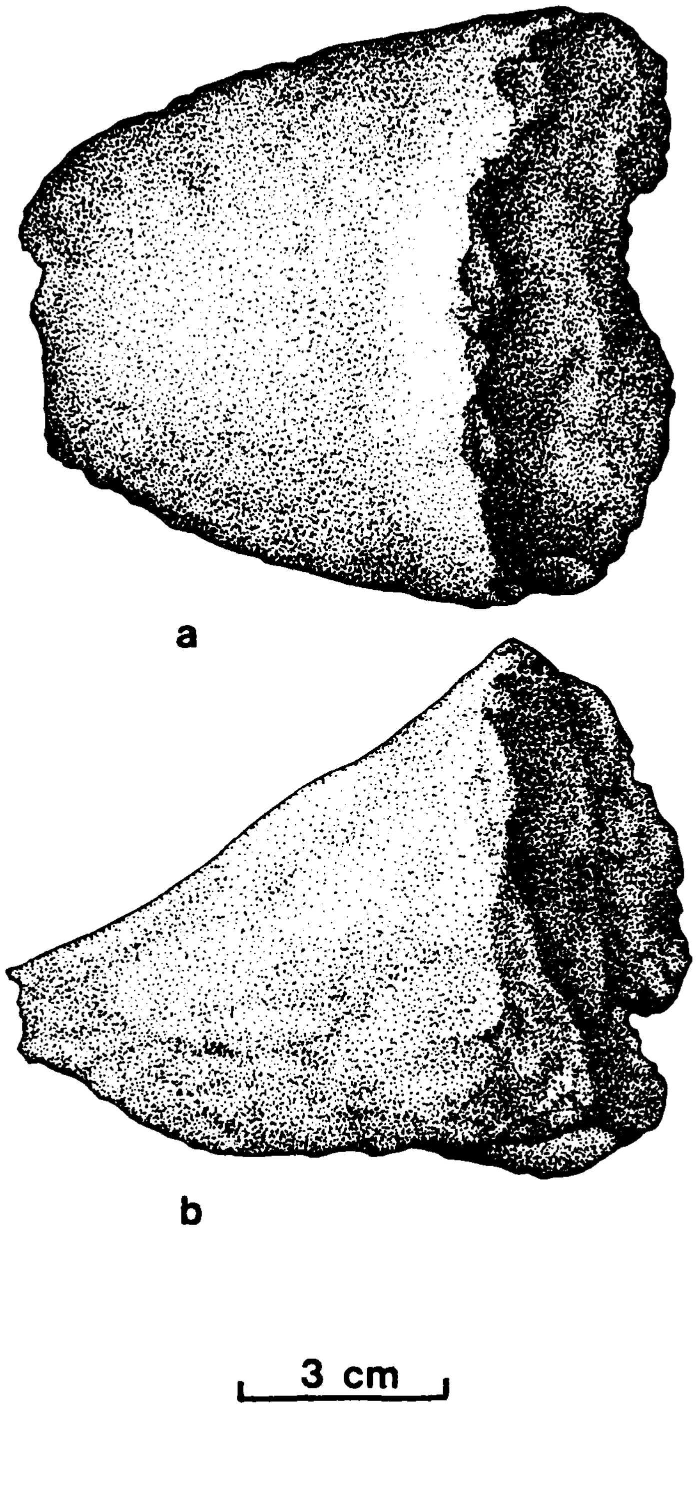

Figure 3.13. Weathered chert artifact, 14BU81: (a) dorsal view; (b) lateral view.

Four fragments of weathered chert (Table 3.10 F,I) were thermally altered. Two of these possess cortical surfaces of the original nodules, which on both objects are discolored to a very dark red. The interior surfaces of these fragments, and the surfaces of the other two interior fragments are less extensively discolored.

Two alternative explanations of differential thermal discoloration are offered. The first alternative is that the stones' most extensive exposure to heat occurred while in nodular form. When the nodules fractured, they were no longer utilizeable, and were discarded. If this alternative were accepted, it would be difficult to posit the use of weathered chert as hearthstones at 14BU81, since such careful monitoring of hearthstone breakage would not be expected. On the other hand, the use of weathered chert in processes such as stone boiling might allow the exclusive utilization of complete nodules.

A second alternative is that the outer, heavily patinated surfaces of the stones are more susceptible to thermal discoloration than the inner surfaces. An experimental evaluation of this alternative would test the hypothesis that, exposed to equivalent amounts of heat, the outer surfaces of weathered chert nodules would become more extensively discolored than exposed interior surfaces. Acceptance of this alternative would provide no evidence for the selective preference of complete over fragmentary weathered chert nodules, and thus would allow the possibility of the use of weathered chert as hearthstones.

The single fragment of sandstone recovered from the site surface possesses one smooth face, 30 cm. wide in its maximum dimension. The specimen's small size precludes definitive discussion of its function, although it was most likely used as a grinding or pulverizing implement.

Two quartzite cobbles, both of which exhibit crushed and battered surfaces on portions of their edges, suggest use as hammerstones. The fractured surface of one fragment possesses a negative bulb of percussion, suggesting that the fracture originated on a utilized margin of the cobble, probably during use.

There are 710 chipped stone artifacts in the 14BU81 surface assemblage, distributed among chert types and technoclasses as shown in Table 3.11. Florence A and Florence B cherts are present in nearly equal proportions. Flint Hills light gray chert is a minimal component of the assemblage, while indeterminate and miscellaneous cherts comprise the remainder.

Table 3.11 shows that the relative frequency of each technoclass within chert types does not vary significantly from its frequency in the assemblage as a whole. With the exception of thermoclastic shatter, there are relatively few empty cells in the table, indicating that each chert type is represented in the assemblage by a nearly full range of technoclasses.

Tested raw material, cortical chunks, and decortication flakes are associated with the procurement and initial reduction of lithic raw material. As shown in Table 3.11, only 49 artifacts (7%) of these classes are present

Table 3.11. Chipped stone technoclasses, chert types, and thermal alteration, 14BU81 surface.

TECHNOCLASS	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Flint Hills Light Gray Heat	Flint Hills Light Gray No Heat	Indeterminate/ Miscellaneous Heat	Indeterminate/ Miscellaneous No Heat	TOTAL Heat	TOTAL No Heat
				CHERT TYPE						
Tested Raw Material	-	3	-	2	-	-	-	1	-	6
total:	3		2		-		1		6	
Core	-	-	-	1	-	1	-	-	-	2
total:	-		1		1		-		2	
Cortical Chunk	-	1	-	6	-	1	1	-	1	8
total:	1		6		1		1		9	
Decortication Flake	1	15	-	9	-	2	1	6	2	32
total:	16		9		2		7		34	
Intermediate Flake	100	104	20	192	2	11	26	86	148	393
total:	204		212		13		112		541	
Noncortical Chunk	7	4	-	9	-	-	2	2	9	15
total:	11		9		-		4		24	
Bifacial Trimming Flake	5	4	2	7	-	2	1	5	8	18
total:	9		9		2		6		26	
Shaped Tool	8	4	8	13	-	1	14	11	30	29
total:	12		21		1		25		59	
Thermoclastic Shatter	-	-	-	-	-	-	9	-	9	-
total:	-		-		-		9		9	
TOTAL	121	135	30	239	2	18	54	111	207	503
total:	256		269		20		165		710	

in the surface assemblage, indicating that initial reduction was not a prevalent site activity.

Evidence of chert procurement is limited to six specimens classified as tested raw material. Five of the six represent relatively small alluvial cobbles, probably procured from nearby gravel deposits. The remaining piece of tested raw material is Cresswell chert, a local type classified here as miscellaneous. This chert is only marginally represented at 14BU81, and was not extensively utilized at the site.

Decortication flakes and cortical chunks, although not numerically abundant in the assemblage, tend to be fairly large, as indicated by the mean weights in Table 3.12. Florence decortication flakes and cortical chunks are especially large, with mean weights of 21.89 and 65.75 gm., respectively, indicating that the initial reduction of relatively large pieces of these materials occasionally occurred at the site.

In contrast to the low frequency of decortication elements, the 541 intermediate flakes comprise a large proportion (over 75%) of the surface collection. These flakes tend to be small, as demonstrated by mean weight (Table 3.12). It is most likely that these flakes are the product of bifacial reduction, rather than the products of a core technology. This suggestion is based on the minimal evidence of cores in the assemblage, and on the relative abundant evidence of bifacial tool manufacture, discussed below.

The two cores from 14BU81 are single-ended, each possessing a single platform. The core illustrated in Figure 3.14a is of Flint Hills light

Table 3.12. Mean weight in grams of various chipped stone technoclasses, 14BU81 surface.

Technoclass	Florence A	Florence B	Flint Hills Light Gray	Ind./ Misc.	Mean Wt. TOTAL
Cortical Chunks	72.00	65.75	5.10	10.40	53.56
Decortication Flakes	6.50	21.89	11.80	4.64	10.50
Intermediate Flakes	1.19	1.44	2.24	1.52	1.38
Noncortical Chunks	8.87	12.27	-	7.90	9.98

gray chert. Flakes were detached along two opposite margins of the platform, terminating in a ridge at the core's base. The second core, of Florence B chert, was fashioned on a large laterally expanding flake, the ventral surface of which served as a platform. Flakes were detached from a lateral margin and terminated in a central ridge, the unflaked side of which is cortical (Fig. 3.14c,d).

Data on heat treatment (Table 3.11) suggests that thermal alteration was not a significant part of initial reduction at the site, since there are only three thermally altered cortical elements in the surface collection. Among intermediate flakes and noncortical chunks, Florence A chert was thermally altered with greater frequency than other types. Low ratios of heated to nonheated intermediate elements are observed among Flint Hills light gray and Florence B cherts.

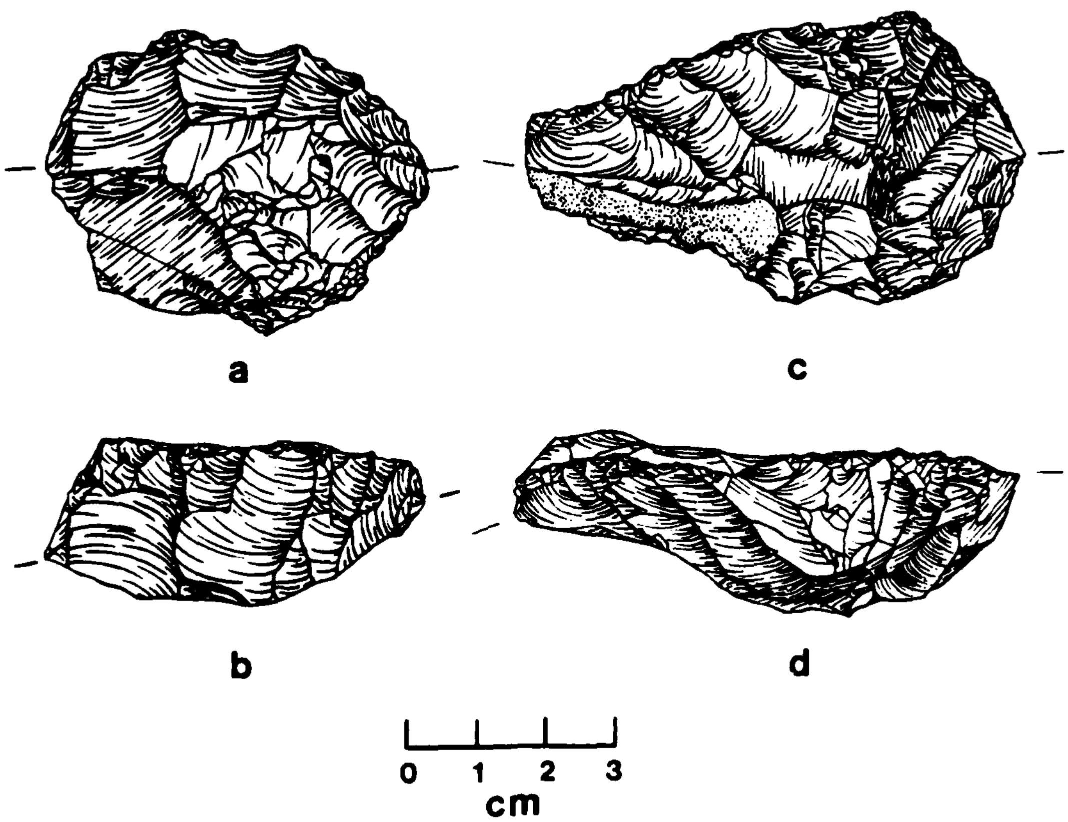

Figure 3.14. Cores from 14BU81: (a,c) dorsal views; (b,d) lateral views.

Over half of the 59 shaped tools from the site were thermally altered (Table 3.11). As will be shown below, thermal alteration of chert was an important process in the manufacture of a certain class of bifacial preforms at the site. The high incidence of shaped tool thermal alteration is not reflected in bifacial trimming flakes, fewer than half of which were thermally altered. This is perhaps best explained by the broad range of tool types within the shaped tool category, among which there is considerable variation in the incidence of heat treatment (see below).

The 66 retouched flakes in the surface assemblage exhibit a diversity of functional edge types, including 17 cutting, 21 scraping, and 9 notched edges. Less frequently occurring are perforator/graver (n=5), denticulate (n=2), and heavy chopping (n=2) edges.

Of the 10 flakes exhibiting more than one functional edge (multiple flakes), 5 possess a cutting edge and notched edge in combination. Notched edges are also observed in combination with scraping edges (n=2) and perforator/gravers (n=1). Of the 16 notched edges observed in the assemblage, eight occur on multiple use flakes, suggesting that the activities associated with notched edges frequently co-occurred with other activities, noticeably those associated with cutting edges.

The 59 shaped tools from the 14BU81 surface collection are placed into five groups as follows:

I. Projectile points (12)

II. Drill (1)

III. Bifacial preforms (37)

IV. Partially shaped bifaces (7)

V. "Heavy duty" bifaces (2)

The distribution of shaped tools among chert types is presented in Table 3.13. For the analysis of shaped tools from 14BU81, a fifth chert type was created to accommodate a material which, although distinct from Florence A, Florence B and light gray cherts, was too abundant to justify its inclusion with indeterminate and miscellaneous materials. Termed "Flint Hills green" by previous researchers (Haury 1979), this chert is somewhat comparable to Florence A in its color, luster and surface texture, but lacks the banding, mottling and fossiliferous inclusions observed in Florence A; in general, it is extremely homogenous. A very thin limestone cortex is present on some pieces. Although not discussed previously, this chert type is present among intermediate flakes from the surface collection, although no decortication elements of the material occur. Thus, the material was most likely brought to the site in ready to use form, most likely for use in the manufacture of bifacial preforms, the category within which it is most abundant (Table 3.13).

Table 3.13. Chert types of shaped tools, 14BU81 surface.

Category	Florence A	Florence B	Light Gray	Green	Ind./ Misc.	TOTAL
Projectile Point	2	5	-	2	3	12
Drill	-	1	-	-	-	1
Bifacial Preforms	10	10	-	13	4	37
Partially-Shaped Bifaces	-	5	-	1	1	7
Heavy-Duty Bifaces	-	-	1	-	1	2
TOTAL	12	21	1	16	9	59

Two artifacts were classified as "heavy duty" bifaces. One of these (Fig. 3.15a) is fashioned from a coarse-grained, unidentified chert exhibiting no thermal alteration. Planoconvex in cross-section, the tool's flat side (opposite that illustrated) possesses remnant cortex in the form of a reddish patina. Near the proximal end, two broad notches are present, indicating that the tool was probably hafted as an axe. Step faceting and edge rounding is observed on the tool's lateral margins, which form edge angles of approximately 50°.

The second heavy duty biface (Fig. 3.15b) is the only shaped tool of Flint Hills light gray chert recovered (Table 3.13). No thermal alteration of the specimen is evidenced. The transversely oriented working edge (uppermost in Fig. 3.15b) forms an angle of 45°, and is heavily polished from use. Polishing is confined to only a portion of the edge, indicating that resharpening occurred after the polish developed, and that subsequent use (if any) resulted in no additional polishing. The presence of polish on heavy celt-like bifaces has been attributed to use as digging implements (Klippel 1972), although Kamminga (1977) demonstrates that polished surfaces can also develop through the working of soft woods and bark.

The seven specimens described here as "partially shaped bifaces" were only roughly shaped prior to use or discard. No thermal alteration of these artifacts was evidenced. Five are relatively large, thick specimens which appear to have been bifacially worked from relatively unaltered pieces of raw material. Three of these are of Florence B chert, one is of Flint Hills green, and one is of a coarse-grained material resembling Cresswell (Table 3.13).

Two partially shaped bifaces are relatively thin artifacts possessing parallel lateral edges with edge angles of about 30°. The orientation of these acute edges suggest suitability for cutting functions; it is suggested

here that they represent minimally shaped, ad hoc bifacial knives. Both are manufactured of Florence B chert.

Twelve projectile points were recovered from the site surface, four of which are notched, while seven are stemmed. One distal fragment of an isosceles triangular bladed form is also present. The temporal and cultural implications of these forms was discussed above. As shown in Table 3.13, five of the 12 projectile points were fashioned from Florence B chert. However, only stemmed points were fashioned of Florence A or Flint Hills green chert. Two notched points are of Florence B chert, and two are of unknown types. Only three projectile points, including two notched points and one isosceles triangular point fragment (all of Florence B chert), were thermally altered. No thermal alteration of stemmed points was observed (Table 3.14).

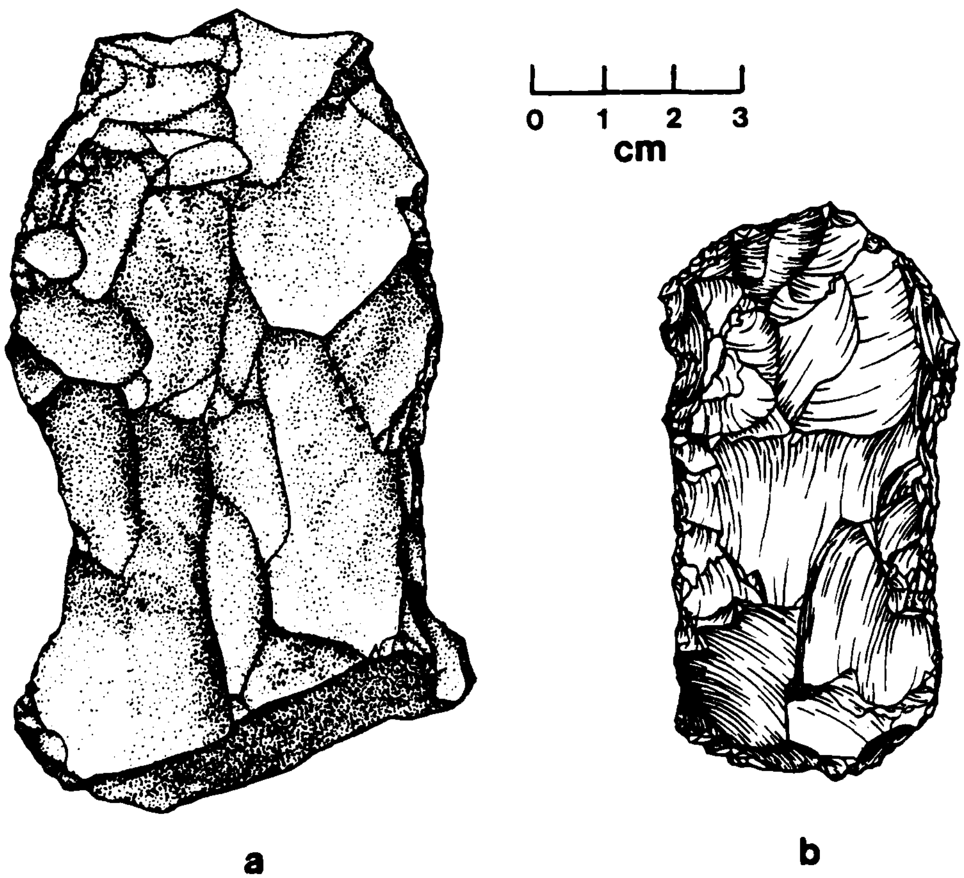

Figure 3.15. Heavy duty bifaces from 14BU81.

Table 3.14. Thermal alteration of projectile points and preforms, 14BU81 surface.

Chert Type	Heated Proj. Point	Heated Pre-form	Total Heated	Unheated Proj. Point	Unheated Pre-form	Total Unheated	TOTAL
Florence A	-	8	8	2	2	4	12
Florence B	3	4	7	2	6	8	15
Flint Hills Green	-	10	10	2	3	5	15
Ind./Misc.	-	4	4	3	-	3	7
Totals	3	26	29	9	11	20	49

Five projectile points (one notched and four stemmed) exhibit impact fractures, suggesting use as projectiles (Fig. 3.12 d,f). Although all points may have been subjected to secondary utilization, the detailed analysis required for such determination was not undertaken.

Thirty-seven artifacts are categorized as bifacial preforms. Application of the term "preform" to these artifacts may be misleading, in that the existence of a subsequent, more formalized or finished manufacturing stage is implied. With present data, no such stage can be demonstrated at 14BU81. It is obvious that the preforms do not represent an earlier stage in the manufacture of projectile points, given the difference between the two categories in the frequency of thermal alteration (Table 3.14). A great deal of morphological variability exists within the preform category; some of the artifacts here termed preforms may have been broken in utilization or maintenance processes. Evaluation of this possibility would require detailed analyses of breakage and wear patterns beyond the scope of this report. However, most of the artifacts described here were most likely broken during a manufacture process, and thus represent artifacts to which the term preform may be justifiably applied.

Florence A, Florence B, and Flint Hills green chert are represented among the preforms in equivalent proportions, with unidentified chert present in lesser numbers (Table 3.13). Only Florence B chert preforms have more unheated than heated specimens. By contrast, preforms of Florence A, Flint Hills Green and unidentified chert are predominately heat treated.

All 37 preforms are broken, and may be grouped as follows, according to tool condition:

A. Distal fragments: Lateral edges converge to a point or near-point (n=8).

B. Proximal fragments: Lateral edges converge to an ovate or straight base (n=6).

C. Medial fragments: Fragments possessing lateral edges from which no determination of convergence is possible (n=16).

D. Multisegmented fragments: Sufficient portions of the tool margins are present to permit outline reconstruction (n=7).

Two types of breakage are observed on these preforms. The presence of potlidding on or near a fractured surface, or the presence of the characteristic "crenated" fractures (Fig. 3.16d) described by Purdy (1975:137), indicate thermally induced breakage, while the presence on the fracture surface of flake ripples, a bulb of percussion, or other features of conchoidal fracture are evidence for mechanical breakage during manufacture or use (Collins 1974). Some artifacts exhibited both kinds of fractures.

As shown in Table 3.15, thermally induced fractures were the predominate fracture noted on medial fragments, while mechanical fractures were more frequent among distal and proximal fragments. Since 14 out of 16 medial fragments exhibit thermal alteration (Table 3.16), the high incidence of thermal damage is not unexpected. By contrast, heat treatment is not as frequently observed among the distal and proximal fragments, which show a higher incidence of mechanical, relative to thermal, breakage.

Table 3.15. Breakage types observed on bifacial preforms, 14BU81 surface.

	Breakage Type			
Condition	Mechanical	Thermal and Mechanical	Thermal	Total
Distal	6	-	2	8
Proximal	5	1	-	6
Medial	5	2	9	16
Multisegment	3	1	3	7
Total	19	4	14	37

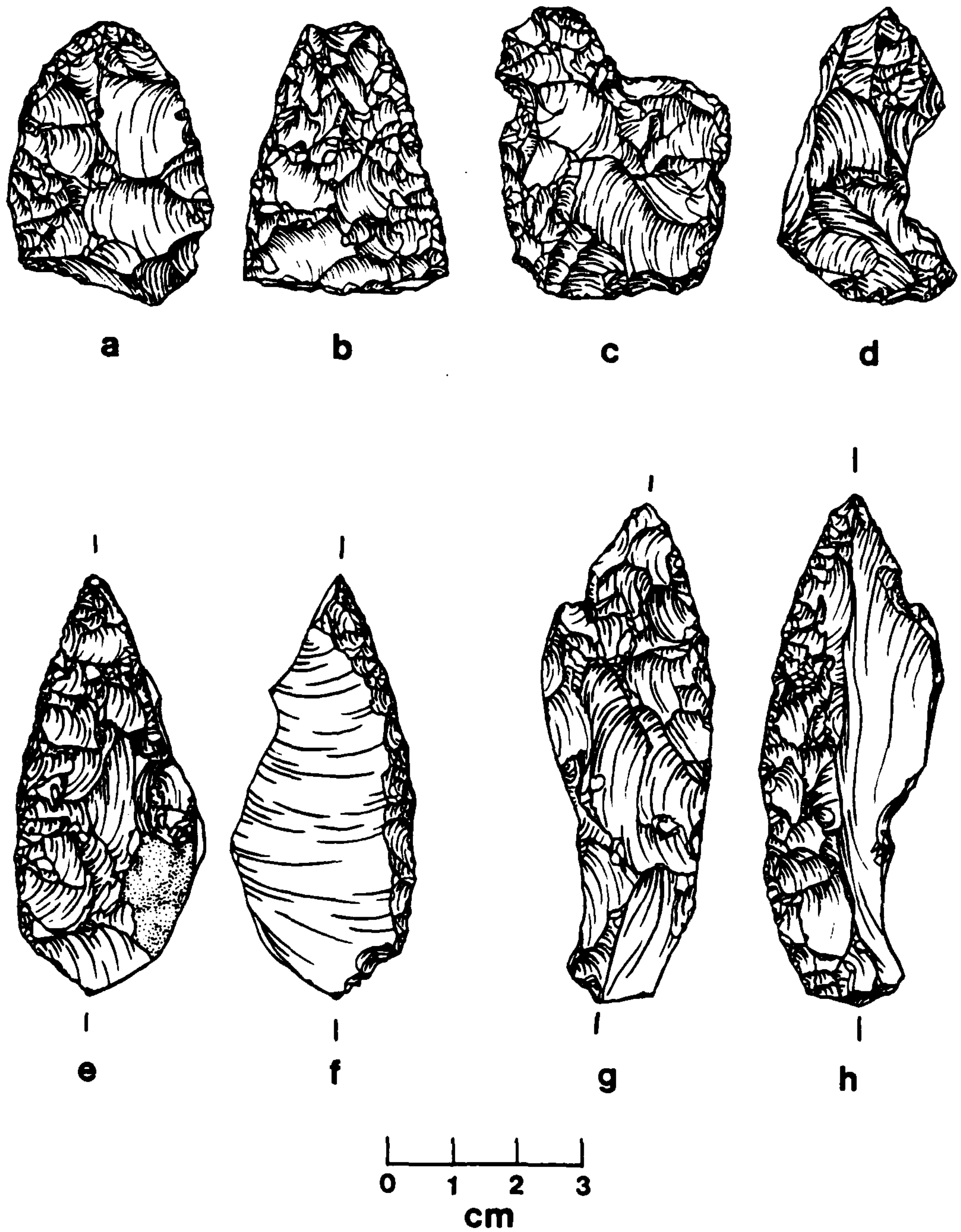

Figure 3.16. Bifacial preforms from 14BU81: (a-b) distal fragments; (c) proximal fragment; (d-h) multisegmented fragments.

Table 3.16. Thermal alteration of preforms, 14BU81 surface.

Condition	Heat	No Heat	Total
Distal	4	4	8
Proximal	2	4	6
Medial	14	2	16
Multisegmented	6	1	7
Total	26	11	37

Proximal preform fragments exhibit two basal shapes. Four possess straight bases (Fig. 3.16c), while two exhibit ovate bases (Fig. 3.16d). A similar range in basal shapes is noted at 14BU9 by Grosser (1973:234).

The distal fragments present considerable morphological variability. A bimodality of maximum thickness exists within the category. Three fragments have thicknesses of 8 to 10 mm., while the thicknesses of the other five range from 4 to 6 mm. Either heavier tool types, or less finished manufacturing stages are represented by the thicker group, two of which are illustrated in Figure 3.16 (a,b). Among the thinner group, three specimens represent manufacturing rejects. One of these is similar to ovate preforms present in the multisegmented category in terms of raw material and the presence of thermally induced fractures. A second distal fragment is also regarded as a preform, since it is invasively flaked on only one surface. The opposite face is marginally retouched, suggesting that breakage occurred before this side could be worked. A similar retouching and breakage pattern is illustrated in Figure 3.16 (e,f). The third distal fragment lacks evidence of final shaping and is therefore termed a preform. The specimen is heat treated, although its fracture was not thermally induced.

Two remaining distal fragments represent the tips of relatively finished artifacts. One of these is fashioned of unheated Florence B chert, and possibly represents the tip of a projectile point such as illustrated in Figure 3.12b. The second distal fragment is of unheated Florence A chert, and bears no resemblance to other tools in the assemblage.

Six of the seven multisegmented fragments represent ovate-based preforms, the smallest and largest of which are illustrated in Figure 3.16 (d,h). Of these six artifacts, two represent mechanical breakage, three possess thermally induced fractures, and one exhibits both breakage types. All exhibit essentially similar subovate outlines, and all but one are

thermally altered. It is suggested that the ovate based proximal fragments, and one distal fragment, as well as most of the medial fragments represent artifacts of similar form; thus this category of bifacial preforms constitutes a significant component of the 14BU81 assemblage.

Despite the mixture of archeological components in the 14BU81 surface assemblage, consistent trends in the character of site utilization seem evident, such as the low frequency of initial lithic reduction. This consistency is referrable to at least two alternative explanations. First of all, the consistency may represent a long term stability in the kinds of activities carried out at the site. This alternative is less desirable than a second, that of the three cultural-historic units in evidence at the site, occupation by groups of one unit was more intensive than those of the other two. The latter alternative is supported by the morphological and technological homogeneity within the category of ovate bifacial preforms and, to some extent, by the high proportion of stemmed points relative to other types.

Unit I Excavated Material

Raw material and chipped stone technoclasses of artifacts from the upper 50 cm. of TP 1 and the upper 60 cm. of TP 2 are presented in Table 3.9.

Four small fragments of limestone, all unburned and of undemonstrated cultural context, were recovered from excavation. Four small fragments of sandstone were recovered from TP 2, one of which exhibits a grooved impression, 3 mm. wide and 2 mm. deep, suggesting its use as an abrader in bifacial tool manufacture or maintenance.

Sixteen weathered chert fragments were recovered (Table 3.17), 13 of which exhibited thermal discoloration. Rounded cortical surfaces were present on eight of the artifacts, including two large fragments, while five exhibited no outer surfaces. The problems discussed above in regard

Table 3.17. Data on excavated weathered chert artifacts, 14BU81.

	Heat	No Heat	Total
Rounded outer surface	8	-	8
Smooth plane surface	-	2	2
Interior fragment	5	1	6
Total	13	3	16

to similar artifacts in the surface collection apply to excavated artifacts as well. The use of these artifacts by prehistoric occupants of 14BU81 cannot at present be specified.

Two weathered chert fragments which exhibit plane surfaces may represent grinding or pulverizing implements, although their small size precludes a definitive statement. Neither is thermally altered.

Unit I excavations yielded 450 chipped stone artifacts, distributed among chert types and technoclasses as shown in Table 3.18. Florence A, Florence B and Flint Hills green chert types are present in equivalent proportions, while Flint Hills light gray and unidentified cherts occur less frequently.

In general, the subsurface chipped stone assemblage conforms to the technological pattern suggested by the surface collection. A primary difference between the surface and subsurface assemblage is the frequency of shaped tools. The 59 shaped tools from the site surface comprise 8% of the surface assemblage, while only 2% of the subsurface assemblage is represented by its nine shaped tools. The higher frequency of shaped tools in the surface collection may be due to sample bias, since under a grab surface sampling technique, bifacial tools, if present, are more likely to be collected than other kinds of debris.

The nine shaped tools from the Unit I excavations include three stemmed projectile points, one drill fragment, four bifacial preform fragments, and one partially reduced biface fragment. Data on these tools are provided in Table 3.19. Although no significant patterning is detected in the provenience of these artifacts, locational data are provided.

Only one shaped tool, a projectile point (Fig. 3.12b) was recovered from TP 1. All other tools were recovered from TP 2. None of the projectile points exhibit thermal alteration; one point possesses an impact fracture, suggesting its use as a projectile.

One distal fragment of a drill, identified by its thick, quadrilateral cross-section, was recovered. Of unheated Florence B chert, the artifact bears no extensive evidence of use. The single partially shaped biface fragment is 13 mm. thick, indicating a fairly large original size. No edge utilization is apparent; most likely the artifact represents a large bifacial preform broken in an early stage of reduction.

Bifacial preforms are represented by one distal, one proximal, and two medial fragments. The distal fragment and one medial fragment, both of unidentified, but identical, cherts, evince thermoclastic damage in the form of crenated fractures. Morphologically, they resemble the ovate preforms recognized in the surface assemblage. The small size of the second medial fragment (maximum dimension 14 mm.) precludes extensive discussion. An edge angle of 15^{o} suggests that a nearly finished tool, suitable for cutting or piercing tasks, is represented.

The proximal preform fragment, of unheated Florence A chert, was broken and discarded before the cortical platform of the original flake blank

Table 3.18. Chert type and thermal alteration of chipped stone technoclasses, 14BU81, Unit I excavation.

	CHERT TYPE											
	Florence A		Florence B		Flint Hills Light Gray		Flint Hills Green		Ind./ Misc.		TOTAL	
TECHNOCLASS	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
Cortical Chunk	-	1	-	-	-	-	-	-	1	1	1	2
total:	1		-		-		-		2		3	
Decortication Flakes	2	5	-	4	-	-	2	5	2	9	6	23
total:	7		4		-		7		11		29	
Intermediate Flakes	50	78	34	92	-	1	39	74	4	9	127	254
total:	128		126		1		113		13		381	
Noncortical Chunks	1	1	-	1	-	-	1	-	-	1	2	3
total:	2		1		-		1		1		5	
Bifacial Trimming Flakes	2	2	-	7	-	2	4	3	1	-	7	14
total:	4		7		2		7		1		21	
Shaped Tools	-	2	-	5	-	-	-	-	2	-	2	7
total:	2		5		-		-		2		9	
Thermoclastic Shatter	-	-	-	-	-	-	-	-	2	-	2	-
total:	-		-		-		-		2		2	
Total	55	89	34	109	-	3	46	82	12	20	147	303
total:	144		143		3		128		32		450	

Table 3.19. Data on excavated shaped tools, Unit I, 14BU81.

	Quad	Depth (cm. BS)	Condition	Chert Type	Heat[a]	Break Type
Projectile points (3)						
	1SW	46	Complete	FLB	-	Absent
	2SE	15	Medial	FLB	-	Impact
	2SW	40	Distal	FLA	-	Mechanical
Drill fragment (1)						
	2NE	20-30	Distal	FLB	-	Mechanical
Biface preform (4)						
	2NE	00-20	Distal	IND	+	Therm/Mech
	2NW	00-20	Medial	IND	+	Thermal
	2SW	20-30	Medial	FLB	-	Mechanical
	2NE	43	Proximal	FLA	-	Mechanical
Partially shaped biface (1)						
	2NW	22	Medial	FLB	-	Mechanical

[a] +=present, -=absent

could be removed. One lateral edge of the specimen is unworn, while the opposite edge is heavily rounded, indicating the edge's preparation for further trimming.

Fifteen retouched flakes, including two multiple use flakes, were recovered from Unit I excavations. Five cutting edges, seven scraping edges, and five notched edges were observed. One multiple use flake possessed a cutting and a notched edge, while the other possessed two scraping edges. Despite the smallness of the sample, no significant variation is present between subsurface and surface retouched flakes.

In general, there appears to be little difference in the character of surface and subsurface assemblages from 14BU81's upper component. This is perhaps not unexpected, since 215 of the 450 subsurface artifacts (48%) analyzed are from plowzone levels of TP 1 and TP 2. Despite the fact that the only diagnostic artifacts recovered below the site surface were stemmed El Dorado phase projectile points, there is insufficient evidence to conclusively demonstrate that the subsurface Unit I cultural residue is a homogenous El Dorado phase deposit. Further investigations are needed to

seek stratigraphic and artifactual evidence allowing detection and separation of Unit I's various occupations.

Unit II Excavated Assemblage

Despite the small areal extent of excavations, a large quantity of cultural debris was recovered from Unit II at 14BU81, most of which was concentrated between 130-158 cm. BS in TP 2 and 90-100 cm. BS in TP 1 (Table 3.12; Fig. 3.11). As shown in Table 3.9, the abundance of artifacts in the assemblage is not reflected in the diversity of categories. Chipped stone and bone are the only two raw materials represented; chipped stone is by far the more abundant of the two.

There is a significant difference in comparative artifact densities of TP 1 and TP 2. Only 34 artifacts, all of chipped stone, were present in the 90-100 cm. level of TP 1, indicating that the densest concentrations of materials occurred in TP 2. In addition to the large amount of chert chipping debris, all faunal material and shaped tools were recovered from this test pit (Table 3.9).

Within TP 2, the densest concentration of artifacts was in the SW quadrant, the 130-150 cm. levels of which yielded 602 chipped stone specimens. By contrast, the same levels of the other three quadrants yielded 977 artifacts. The SW quadrant contained two lithic concentrations, designated Features 1 and 2. Identified during excavation as especially dense concentrations of chipping debris, Feature 1 was completely within TP 2-SW, while Feature 2 extended into TP 2-SE (Fig. 3.17). Both features were lenticular in cross-section, 4-5 cm. deep and approximately 25-30 cm. in diameter. Feature 1, encountered at a depth of 145 cm., yielded 258 chipped stone artifacts and two fragments of bone, while Feature 2 (Fig. 3.18), encountered at a depth of 146 cm., yielded 121 chipped stone elements and four bone fragments (Table 3.20 and 3.21). These features are discussed at greater length below.

Data on faunal materials are presented in Table 3.20. All 46 specimens are from TP 2, and were most abundant in the SW quadrant. All bone recovered was calcined, indicating burning. Despite the small size of the fragments (the largest of which was 12 mm. in maximum dimension), 24 specimens were identifiable as carapace fragments of small turtles, such as tortoises (Testudinidae) or pond turtles (Emydidae). The remaining bone is unidentifiable, although small game animals are most likely represented.

With no recognizable exception, all 1992 chipped stone artifacts analyzed here are of Florence A chert. The homogeneity noted in chert type is also apparent in the low diversity of technological classes. No cores or tested raw materials were recovered. Cortical and noncortical chunks were present in such low frequencies that they were combined for analysis with decortication flakes and intermediate flakes to form two categories of cortical and noncortical elements. Noncortical elements also included bifacial trimming flakes, under an assumption that bifacial reduction was the primary activity evidenced in the assemblage. Only four shaped tools were recovered,

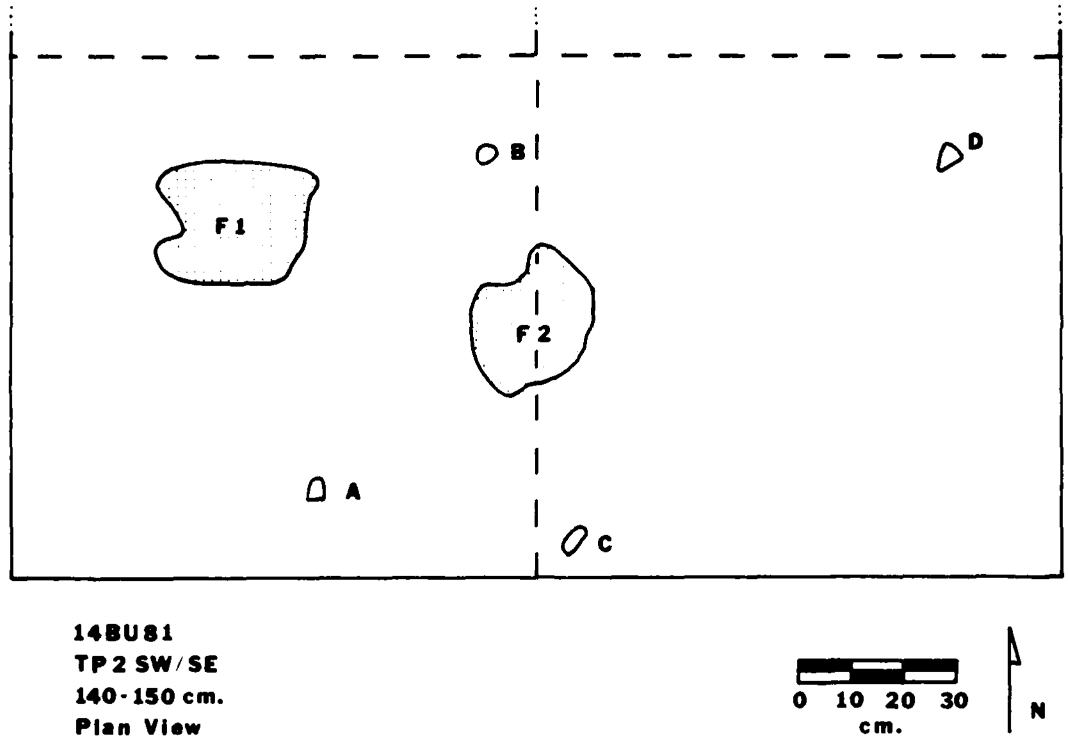

Figure 3.17. Plan view of features and shaped tools in Unit II, TP 2, 14BU81.

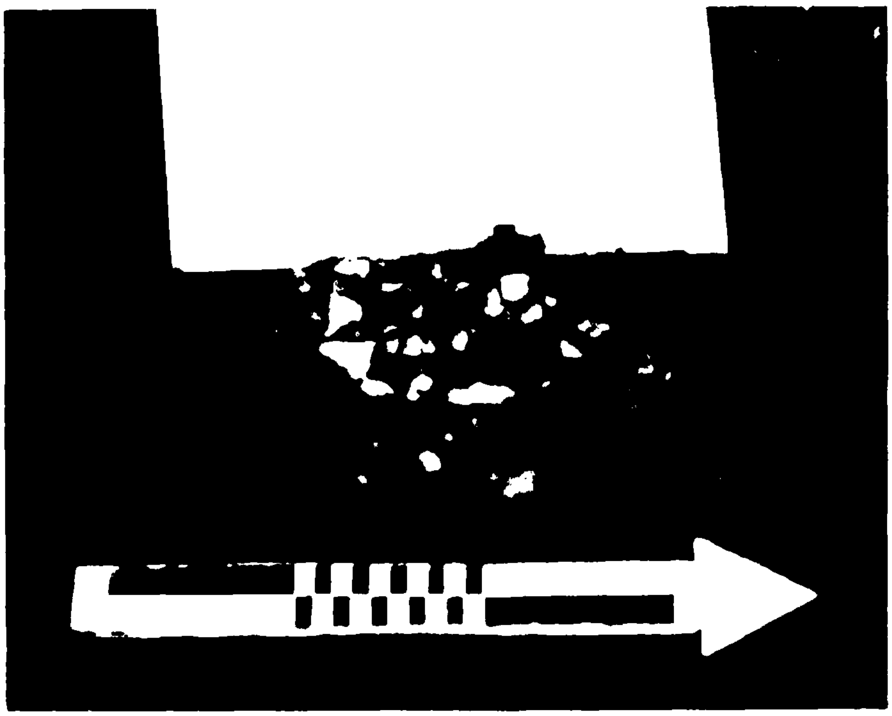

Figure 3.18. Feature 2, a concentration of chipped stone from Unit II, 14BU81.

Table 3.20. Faunal material, Unit II, 14BU81.

Provenience	Turtle	Small Animal	Total
TP2SW 140-150 cm.	21	18	39
TP2SE/NE/NW 140-150 cm.	-	1	1
Feature 1	-	2	2
Feature 2	3	1	4
Total	24	22	46

Table 3.21. Chipped stone technoclasses and thermal alteration, Unit II, 14BU81.

	Cortical		Noncortical		Shaped Tools		Total	
	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
TP2SW								
130-140 cm.	3	-	177	12	-	-	180	12
total:	3		189		-		192	
140-150 cm.	9	2	375	22	2	-	386	24
total:	11		397		2		410	
TP2SE/NE/NW								
130-140 cm.	13	1	152	20	-	-	165	21
total:	14		172		-		186	
140-150 cm.	33	10	652	121	2	-	687	131
total:	43		773		2		818	
Feature 1	4	1	222	31	-	-	226	32
total:	5		253		-		258	
Feature 2	6	4	105	6	-	-	111	10
total:	10		111		-		121	
TP1 90-100 cm.	-	1	29	4	-	-	29	5
	1		33		-		34	
Total	68	19	1712	216	4	-	1789	490
total:	87		1928		4		2019	

all of which represent partially shaped bifaces. The distribution of these technoclasses by provenience unit is presented in Table 3.21.

Inspection of Table 3.21 indicates that all Unit II provenience units (including TP 1 materials) have in common both a low frequency of cortical elements and a high frequency of thermal alteration. To facilitate comparison, the ratios of cortical elements and nonheated elements to the total number of chipped stone specimens for each provenience unit are presented in Table 3.22. These data show that TP2-SW yielded proportionately fewer cortical elements and non-heated specimens than the combined sample from the other three quadrants. In the 130-140 cm. and 140-150 cm. levels of TP2-SW, the relative frequency of cortical elements is 0.016 and 0.027, respectively, while in the same levels of the other three quadrants, higher ratios of .075 and .054 occur. Similarly, the proportion of nonheated elements is consistantly less in the SW than in the other quadrants (.062 and .063 in TP2-SW, compared to .113 and .168 in the others).

The ratios of cortical elements and unheated elements obtained from TP2-SW exhibit little variation between the two 10 cm. levels. It might be assumed that as the time required to accumulate 20 cm. of cultural deposit increases, the variability exhibited by materials from the upper and lower 10 cm. of the deposit should also increase. Accepting this assumption, the lack of variation between the 130-140 and 140-150 cm. levels

Table 3.22. Ratios of cortical elements and unheated elements to total chipped stone, 14BU81, Unit II.

	Cortical Element Ratio $\frac{C}{C+NC}$ [a]	Unheated Element Ratio $\frac{NH}{H+NH}$ [a]
TP2SW		
130-140 cm.	.016	.062
140-150 cm.	.027	.063
TP2SE/NE/NW		
130-140 cm.	.075	.113
140-150 cm.	.054	.168
Feature 1	.019	.124
Feature 2	.083	.083
TP 1 90-100 cm.	.029	.121

[a] C = Cortical elements; NC = Noncortical elements
H = Heated elements; NH = Nonheated elements

of TP2-SW is consistent with the suggestion, made previously, that the Unit II occupational residues accumulated fairly rapidly, with little extensive post-depositional disturbance.

This explanation does not readily account for the large amount of variation exhibited between levels in the other three quadrants, which were necessarily deposited under the same conditions as TP2-SW. It is possible that combining materials from all three quadrants into a single sample obscured the between-levels consistency observed in TP2-SW, but since the materials were combined during excavation, this possibility cannot be evaluated.

Data in Table 3.22 indicate that neither Feature 1 or Feature 2 (F1 or F2) are directly comparable to materials from the surrounding matrix, the 140-150 level of TP2-SW. While F1's cortical element ratio (.019) is within the range of TP2-SW, its nonheated element ratio (.124) is well beyond. The reverse holds for F2; the nonheated element ratio (.083) is comparable, but the cortical element ratio (.083) is not.

These differences, although of small magnitude (like all the ratios discussed here), suggest a cultural origin for the two features, since if they were simply random or post-depositional accumulations of debris, a closer similarity to materials from the surrounding matrix would be expected. At the same time, from the data available, it is difficult to evaluate the cultural nature of the features. During excavation, it was thought that the concentrations might represent debris resulting from bifacial reduction, since three bifaces were recovered in close proximity (Fig. 3.18). However, the high frequency of cortical elements in F2, and the high incidence of nonheated elements in F1 does not support this interpretation, since the three associated bifaces are heat treated and possess no cortex. The available data, therefore, suggest that the features are the result of prehistoric behavior, although the nature of that behavior is not clear.

Four shaped tools were recovered from the cultural deposit in TP 2, two from the SW and two from the SE quadrant. These artifacts are illustrated in Figure 3.19, and their location in TP 2 is shown in Figure 3.17. Each artifact is referenced by the same letter in both figures.

All four tools are of thermally altered Florence A chert and are described as partially shaped bifaces, implying that they were discarded prior to acquiring a finished shape. Of the three artifacts nearest the cultural features (Fig. 3.17 and Fig. 3.19a-c), two exhibit rounded, or ovate ends (Fig. 3.19a-b), while the third (Fig. 3.19c) possesses lateral edges which converge to a straight, transverse margin. Bifacial retouch on all three is restricted to primary shaping; in their unfinished, fragmentary form, it is not possible to determine whether proximal or distal ends are represented, or what form the artifacts had prior to breakage.

The transverse breaks on all three artifacts were probably mechanically induced during manufacture. One artifact possesses a notch-shaped retouched edge (Fig. 3.19b), suggesting that the tool's edge was utilized, probably after breakage.

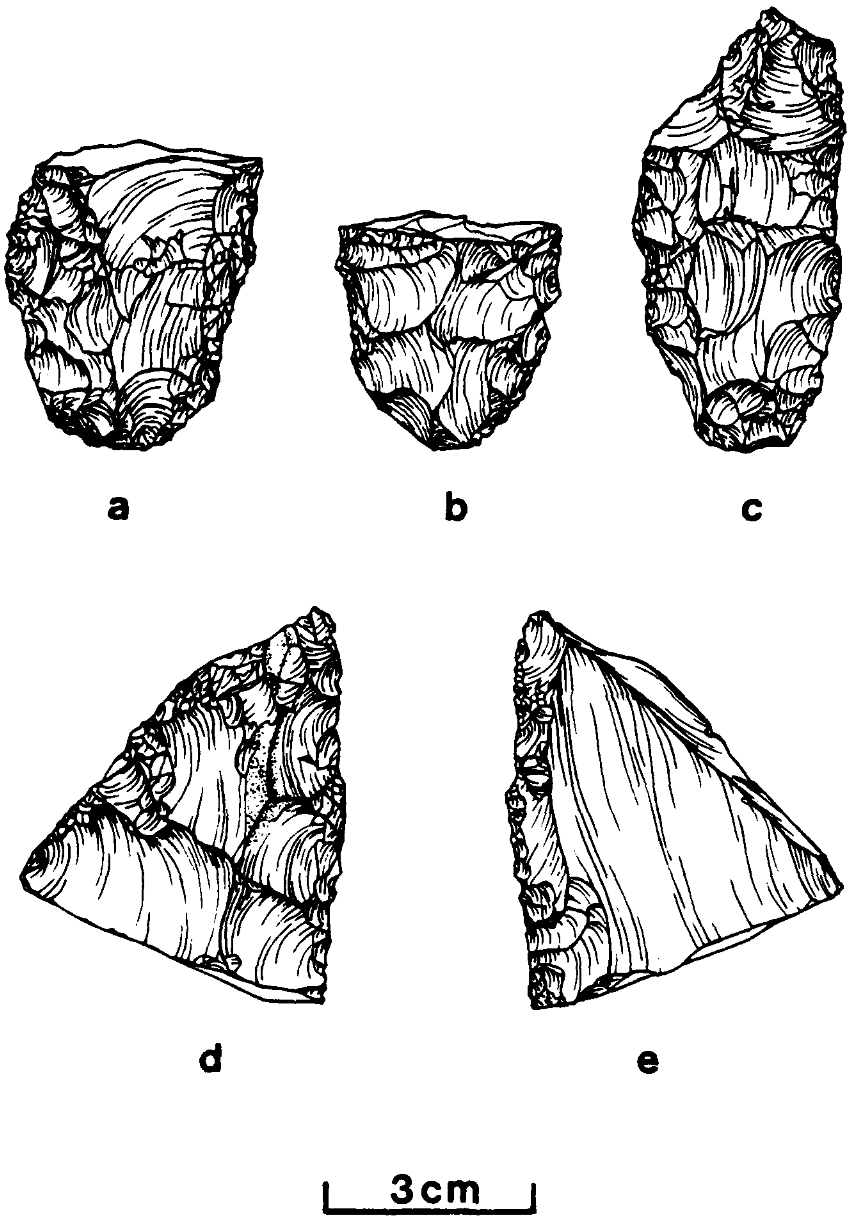

Figure 3.19. Shaped tools from Unit II, 14BU81: (a,b) ovate-ended bifaces; (c) transverse-based biface; (d,e) medial fragment.

The fourth biface (Fig. 3.17 and Fig. 3.19d) is a medial fragment of a fairly large biface. The single intact bifacial edge is straight, and forms an angle of 60°. The two other margins of the tool are fracture surfaces which suggest mechanical breakage. The artifact surface illustrated in Figure 3.19d has a small amount of remnant limestone cortex. The opposite side (Fig. 3.19e) exhibits an undulating fracture surface which may represent a thermally induced crenated break.

The 34 artifacts recovered from 90-100 cm. level of TP 1 exhibit no significant variation from the TP 2 deposit in the incidence of thermal alteration or the frequency of technoclasses (Tables 3.24, 3.25); in TP1, as in TP 2, the reduction of thermally altered Florence A chert is the only technological activity represented. In addition, as discussed previously, the stratigraphic integrity of the deposit exposed in the backhoe trench suggests the operation of depositional conditions similar to those inferred for the TP 2 deposit. These inferences support the hypothesis that the Unit II deposits encountered in both parts of the site represent a single cultural residue.

The homogeneity of chert type, the consistently high incidence of thermal alteration, and the narrow range of postulated technological activities exhibited by 14BU81's lower cultural deposit are all consistent with the hypothesis that a brief (possibly single) occupational episode is indicated. The abundance of lithic chipping debris and the presence of broken bifaces indicate that the deposit represents a specialized locus for the reduction of heat treated Florence A chert. The absence of large quantities of charcoal or hearth-like features in the excavated area suggests that the actual heat treatment occurred elsewhere. Whether this took place at some other locus on the site, or whether the chert was brought to the site already altered is a problem not approachable with present data. Future excavations at the site, however, could attempt to obtain such data.

Summary and Recommendations

Two vertically stratified cultural deposits were encountered in test excavations of 14BU81. The first of these is exposed on the surface and is present as a relatively intact deposit to depths of 70 cm. A long span of occupation is represented by stylistic indicators of the Walnut and El Dorado phase Archaic. The analyses presented above suggest that occupation by the El Dorado phase groups was most intensive; the intact subplowzone deposits are perhaps associated with this cultural-historic unit.

The lower component on the site, exposed as dense concentrations of thermally altered Florence A chipping debris in both test pits and the backhoe trench, is thought to represent a brief occupational episode. No diagnostic artifacts were obtained, although a striking similarity is noted with the Chelsea phase deposits at 14BU4, where dense concentrations of chipping debris also occurred.

Since 14BU81 will be completely inundated by El Dorado Lake's conservation pool, it is recommended that further investigations be undertaken

to mitigate the effects of this loss. Assessment of the site's significance rests on three points, discussed below.

First, 14BU81 exhibits a long history of occupation. At least three Late Archaic units, two of which are stratigraphically distinct, are recognized at 14BU81, thus embracing one of the longest occupational sequences in the El Dorado Lake area. Although Walnut phase artifacts were recovered only from the site surface, most surface materials were recovered from a low-lying swale-like depression thought to be the result of recent erosion. This suggests that a portion of the recovered surficial debris may represent the collapsing of deposits onto an erosional surface. If this is so, an attempt should be made to locate better preserved Walnut phase deposits beyond the swale. The further investigation of cultural deposits at 14BU81 would increase our control over cultural chronology and diachronic cultural change in the project area.

Test excavations at 14BU81 detected the presence of two stratigraphically distinct, intact cultural deposits. The subplowzone Unit I deposit may represent an El Dorado phase occupation. The proximity of these deposits to the present site surface suggests that a large block excavation could be undertaken without the need to remove extensive amounts of overburden, which is a problem faced in the excavation of other Archaic deposits in the project area such as 14BU4, 14BU9 and 14BU25. Block excavation would provide data on the content and structure of 14BU81's Unit I deposits, which could then be used in investigating synchronic variability between sites of equivalent age in the project area. In addition, the occurrence of charcoal in test excavated deposits suggests the possibility of obtaining a sufficient sample of datable organics to enable a radiocarbon assay.

The significance of 14BU81's pre-El Dorado phase deposit is readily apparent, since few such deposits have been encountered in the project area. The recovery of datable organics or diagnostic artifacts from the site's lower component would be a significant contribution to the regional chronology. The importance of the deposit, however, extends beyond chronological considerations. On the basis of test excavations, it was postulated above that the Unit II deposits represent an occupation of brief duration, which has not been extensively disturbed by either natural processes or subsequent occupations. In the project area, 14BU81's lower component is almost unique in its potential to yield data concerning the prehistoric behavior of a single group at a specific, restricted temporal and spatial locus. Future investigations of the Unit II cultural deposits should seek to determine the areal extent of the deposit, attempting to recover evidence of other activity loci in addition to the locus of chipping debris encountered in the test excavations. The presence of burned bone in the test excavations suggests that fires were probably built on the site; thus, further investigations might expect to encounter hearths. In addition, the recovery of faunal materials indicates the potential for obtaining further subsistence data from the deposits.

Geomorphological investigations at 14BU81 would provide data useful to both archeologists and geomorphologists. The dating of occupational residues contained within the site's alluvial deposits would allow the reconstruction

of rates of deposition, while archeological excavation would provide sediment exposures allowing a more refined interpretation of the site's depositional history, leading to the precise identification of geomorphic units and processes. In turn, this detailed knowledge of the geomorphic units comprising the land surfaces occupied by the site's prehistoric inhabitants would contribute to the development and evaluation of hypotheses concerning prehistoric settlement and subsistence behavior.

To summarize, the significance of 14BU81 is demonstrable on three points: 1) the site exhibits a long occupational sequence, investigation of which would contribute to current knowledge of the area's cultural chronology; 2) the site possesses at least two intact cultural deposits capable of providing data on synchronic intra- and intersite variability; and 3) the site's cultural and natural stratigraphy can contribute to an understanding of the Walnut River's fluvial geomorphology, and man's interaction with prehistoric land surfaces. On the basis of the above assessment of significance, and in view of the site's eventual inundation by El Dorado Lake, 14BU81 is recommended for further salvage mitigation.

14BU89

Physical Description

Located approximately 1.2 km. southwest of the Walnut River's confluence with Durechen Creek, 14BU89 occupies an upland interfluvial ridge between the Walnut River valley on the east, and an intermittent upland drainage on the west. The most prominent topographic feature in the site's vicinity is a precipitous limestone bluff on the site's eastern boundary (Fig. 3.20), which drops almost 8 m. (25 ft.) to the Walnut River floodplain. The escarpment (Fig. 3.21) is capped by a resistant outcrop of massive, Fort Riley limestone.

At present, portions of the bluff in the immediate site vicinity are heavily timbered, although the timber thins and terminates towards the site's northern end. Trees appear to become smaller and younger as the vegetation thins, suggesting that a gradual encroachment of arboreal vegetation from south to north along the bluff has occurred. It is probable, therefore, that the bluffslope has not always been forested, and that during portions of prehistory, an unobstructed view of the Walnut River valley would have been provided from the site.

The site is presently vegetated by an upland prairie grassland community, as it probably has been throughout Holocene times. The site commands an imposing view of the prairie for several kilometers west of the site (Fig. 3.22).

Although 14BU89 lies on property acquired by the Corps of Engineers, only a portion of the site extends below the 1347.5 ft. elevation of El Dorado Lake's flood pool. This elevation corresponds to the 350 cm. contour line in Figure 3.20. The lake's conservation pool, at 1339 ft., will nearly reach the top of the limestone bluff, but will not inundate any portion of the site.

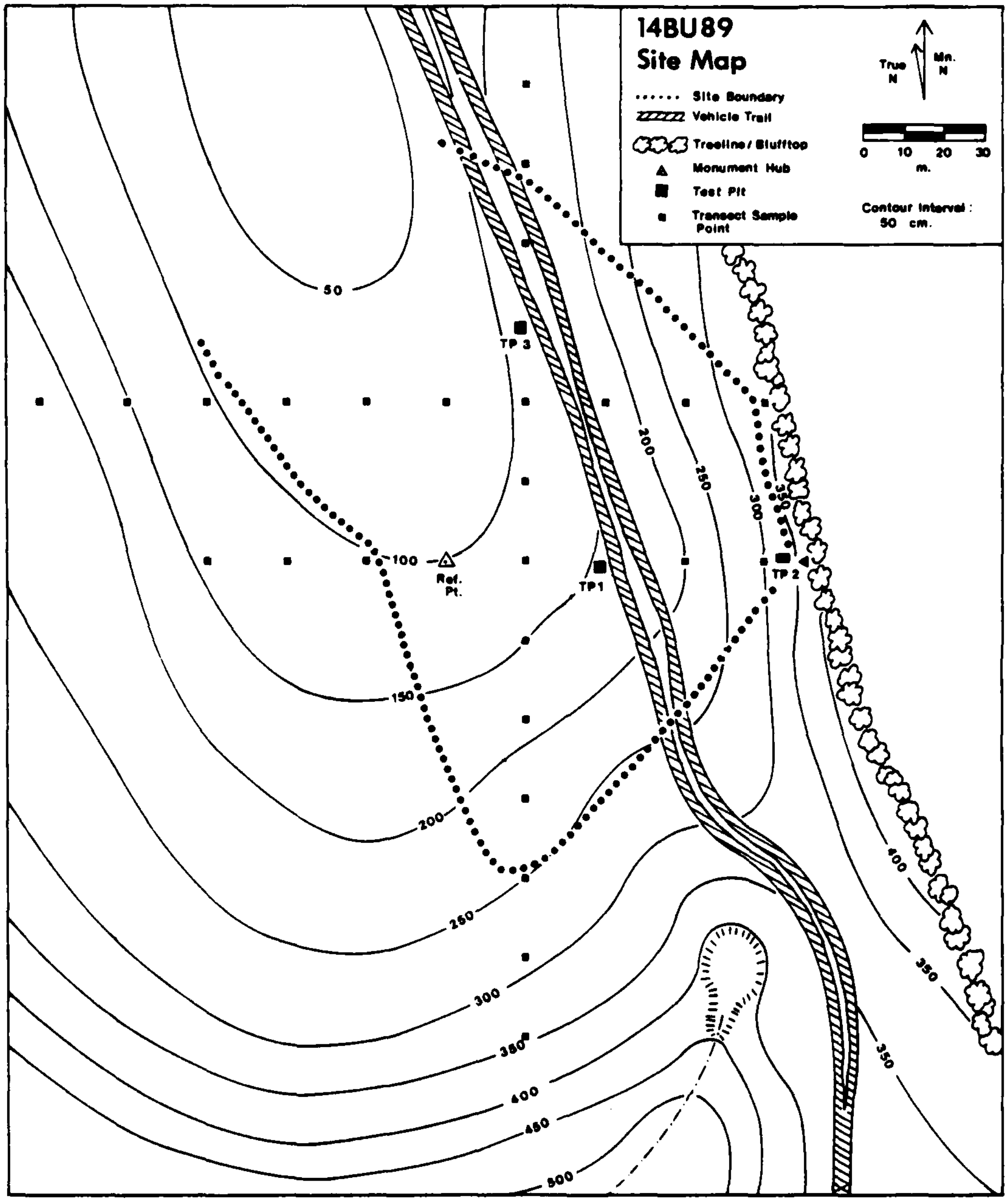

Figure 3.20. Topographic map of 14BU89. Eastern treeline marks edge of bluff. Contours in cm. below an arbitrary reference level.

Figure 3.21. Site 14BU89 occupies an 8 m. limestone bluff, viewed here from the Walnut River floodplain, facing west.

Figure 3.22. Upland prairie vista west of 14BU89, as seen from the site.

Archeological Investigations

Site 14BU89 was initially recorded by University of Kansas personnel during the 1977 pedestrian survey (Root 1979:50). Surface debris was observed and collected at the time from a linear scatter extending 300 m. along the ridge top in the narrow ruts of a vehicle trail. The site's extent beyond the trail could not be determined by survey methods used, since the dense cover of prairie grasses prevented ground surface observation.

The decision to test 14BU89 involved multiple considerations of its archeological significance, suggested by the initial site survey. The site's location in an upland context, first of all, rendered it an almost unique archeological occurrence, since only four upland sites have been recorded in the El Dorado Lake area. Of these sites, 14BU89 offered the most potential for increasing current knowledge of prehistoric utilization of the uplands. The other three sites, 14BU52, 14BU94, and 14BU1010, have to date failed to yield the density of cultural remains present at 14BU89.

The significance of 14BU89 was also increased by the recovery from it of projectile point forms diagnostic of the Archaic period. These are discussed at length below.

Given the site's potential significance, test excavation was undertaken to 1) determine the extent (if any) of impact threatened by inundation; 2) collect data for further evaluation of site significance, including site size, depth, and preservation status of the deposit; and 3) provide information needed to plan the site's future management as a cultural resource.

The first task carried out at the site in 1978 was a grab surface collection of materials from the vehicle trail ruts. On the basis of this collection, a surface scatter comparable in size to that encountered the previous year was defined. The densest material concentration within this area was selected for the location of TP 1, a two meter square excavation unit placed beside the trail.

A point 40 m. due west of TP 1 was selected as an on-site reference point, given the provenience designation of 500N500E, and an elevation of 100 cm. below an arbitrary reference level. For additional provenience control, an east monument hub was placed near the bluff line, 90 m. east of the reference point, and directional bearings were taken with a transit from the reference point to a section corner west of the site and a pipeline benchmark north of the site. These data were recorded in the site records.

Two other test pits were established on the site. TP 2, a 1 by 2 m. unit, was located 85 m. east of the reference point, near the bluff line. This location, at an elevation of 350 cm. below the site's arbitrary reference level, was chosen to test for the site's extension to El Dorado Lake's flood pool elevation.

TP 3 was located 20 m. east and 60 m. north of the reference point, near the northern edge of high-density surface scatter, as observed in the

road ruts. During surface reconnaissance, it was noticed that the greatest concentration of debris in the vehicle trail coincided with the deepest incising of the trail's ruts. Near TP 1, the ruts were much deeper than near TP 3, where little down cutting had occurred. This observation raised the possibility that the "concentration" of debris occurring along the trail reflected no more than the extent of trail erosion. TP 1 and TP 3 yielded similar quantities of cultural debris (Table 3.23), suggesting that no great significance could be attached to the distribution of surface material in the trail.

To determine the site's extent beyond the trail, 31 small "shovel tests" were dug at systematic intervals along four transects across the site (Figs. 3.20 and 3.23). Transects 2 and 3 extended 120 m. north and south, respectively, from a common origin on the 500N base line. Transect 1, 145 m. long, occupied the 500N base line, while Transect 4, 200 m. long, was placed along the 540N line. Transects 1 and 4 both intersected the bluff line at their eastern ends.

At 20 m. intervals along each transect, stakes were driven. Each stake, or sampling point, was referenced by a north-east provenience designation, and by its transect number and sample number within the transect. At each sampling point, a 50 by 50 cm. unit, 10 cm. deep, was excavated. To minimize the time spent clearing vegetation, it proved efficient to place sampling units in areas relatively free of high grasses, but within 1 m. of the sampling point. Soil from the unit was screened through ¼ inch hardware cloth, using a portable 2 ft. square screen large enough to hold the entire sample volume (about 25 liters). All cultural material recovered from the sample was bagged and labeled with provenience data.

The technique described above, termed "transect interval sampling" by Chartkoff (1977), is extremely useful in areas of poor surface visibility such as forests (Lovis 1976) or grasslands. By using a standard sampling interval and sample volumes, a quantifiable estimate of site extent and intrasite variation in debris density may be obtained. At 14BU89, use of this technique was preferable over other techniques, such as plowing the site. As demonstrated below, 14BU89's cultural deposit is contained within 20 cm. of the site's surface. Although plowing would have exposed large surface areas to visibility, it would have completely destroyed any intact cultural features on the site.

At 14BU89, when sample units along a transect no longer yielded cultural debris, it was determined that the site boundary had been reached. To insure that null artifact densities were not due to sampling error, the identification of the boundary was made only after two consecutive sampling points on the transect yielded no artifacts. To meet this criterion, it was necessary to add sampling points 5 and 6 to Transect 3, and points 9-11 to Transect 4. Since Transects 2 and 4 extended eastward to the bluff line, addition of sampling points in this direction was not required.

The results of transect interval sampling, presented in Figure 3.23, reveals that the debris density decreases in all directions from a center near the intersection of Transects 2 and 4. In general, the site outline

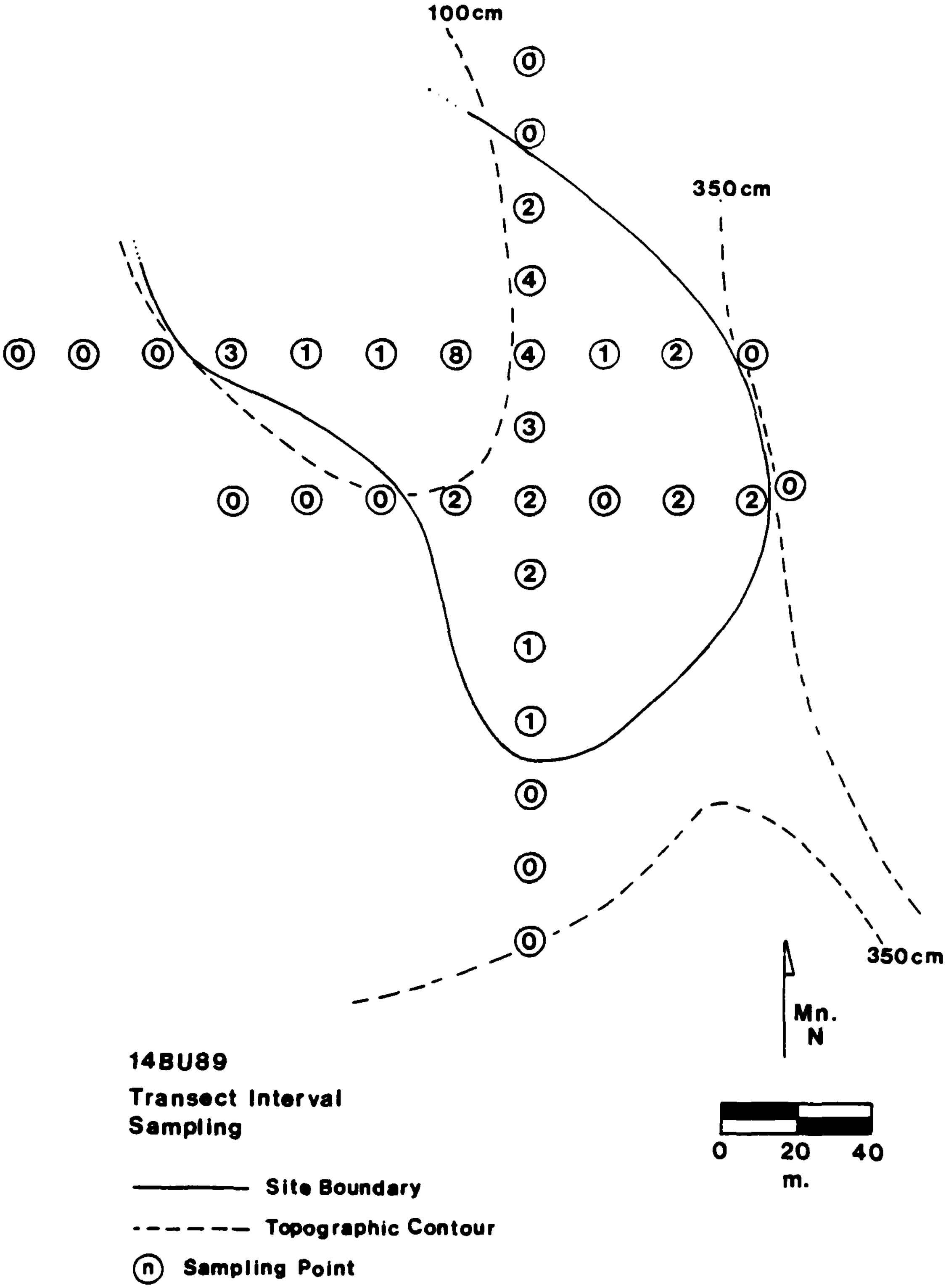

Figure 3.23. Areal extent of 14BU89, as revealed by transect interval sampling.

follows the ridge summit, as shown by the 100 and 350 cm. contours superimposed on Figure 3.23. As delimited in the figure, the site covers an area of about 1.5 ha. (15,000 m.^{2}). The site probably extends farther to the northwest, as suggested by Figure 3.23. Additional transect sampling along the ridge summit would be expected to increased the currently delimited site area. Very little of the site extends below flood pool elevation of El Dorado Lake. Although the site extends to the 350 cm. contour line along Transect 1, and possibly along Transect 4, the major portion of the site is oriented toward the ridge summit, and not the bluff line.

Although the sampling method employed here produces quantifiable results, the precision of its estimate of artifact density across 14BU89 is not great. This is exemplified by the fact that no artifacts were recovered from Sample 6 of Transect 1, although the sample was collected within 1 m. of TP 1. A large sampling error is expected, however, given the low density of artifacts on the site and the small size of the sampling unit. Because of this error, no attempt is made to deal quantitatively with the transect sample results, using techniques such as isopach mapping of artifact densities. Transect interval sampling is employed here as a technique for detecting site boundaries, and as such, is believed to have served adequately.

Site Stratigraphy

TP 1 and TP 3 were excavated in all four quadrants to 20 cm., at which depth the extremely hard clay subsoil became impossible to excavate with shovel and trowel. Although the SW quadrant of TP 1 was excavated to 30 cm. BS, this was accomplished with a pickaxe, and no cultural debris was recovered. The western half of TP 1 was subsequently dug as a single unit to bedrock, which was encountered at about 90 cm. BS. Although cultural debris was recovered below 30 cm., it was most likely introduced to lower levels by natural processes. In both TP 1 and TP 3, deep, vertical shrinkage cracks extended from the surface to considerable depths in the solum. Cultural material could easily be distributed to lower depths by falling down these cracks.

The concentration of artifacts observed in the upper 20 cm. of the deposit, in contrast to the lower densities obtained below this depth, suggests that 14BU89 is completely contained within 20 cm. of the surface. Table 3.23 demonstrates that in both TP 1 and TP 3, the highest concentration of artifacts was in the 10-20 cm. levels. Lower densities in the upper 10 cm. are most likely attributable to natural processes, most importantly the activities of burrowing organisms, such as earthworms. These organisms constantly bring soil to the surface, gradually burying objects deposited there. Simultaneously, the objects subside as burrows beneath them collapse. Over time, the effects of "faunalturbation" (Wood and Johnson 1977:318) tend to result in the downward migration of particles in the solum, sometimes creating a "stone-free layer" which is "typically 10-15 cm. in depth" (Reid 1978:20, citing Edwards and Lofty 1972:164). At Nebo Hill, a Late Archaic upland site near Kansas City, Missouri, this relationship was held to account for the lower debitage densities in the upper 10 cm. of the site's deposit (Reid 1978:20).

Table 3.23. Number of chipped stone artifacts per excavation level, 14BU89.

Depth (cm.)	TP 1	TP 2	TP 3
00-10	47	15	50
10-20	74	11	71

TP 2, a 1 by 2 m. unit located 9 m. from the edge of the bluff, was excavated to 11 cm. BS in its western quadrant and 17 cm. BS in its eastern quadrant, at which depths a limestone regolith was encountered. Cultural material was distributed throughout the thin, humus rich soils of the excavation (Table 3.23).

In mapping the ridge occupied by 14BU89, the Butler County Soil Survey (USDA 1975) placed the slopes within the Labette-Sogn mapping unit, while the ridge top was mapped as Dwight soils. The soils exposed in the three test pits at 14BU89 correspond with these series. TP 2 was clearly excavated in a Sogn soil, described as possessing a thin A1 horizon directly overlying a limestone regolith (U.S.D.A. 1975:18).

The soil profile exposed in TP 1 (Fig. 3.24) corresponds closely to that described for the Labette series by U.S.D.A. (1975:13). The upper 20 cm. of the soil is a very dark gray (5YR 3/1), silty clay loam A1 horizon with a granular structure. The underlying B1 horizon extends from 20 to 50 cm. BS, and is a dark reddish-brown (5YR 2.5/2) clay with blocky structure. The underlying B2t is redder (5YR 3/4) and less blocky, but is texturally similar to the B1. The primary distinction of the B2t in the TP 1 profile is an abundance of gravel sized particles of limestone, distributed throughout the horizon. The B2t horizon has a maximum depth of 70 to 85 cm. The B3 horizon is yellowish-red (5YR 4/6) and very clayey. It immediately overlies the limestone regolith, which in TP 1 was encountered at about 85 cm. BS. The regolith does not represent bedrock, but rather a horizon of partially weathered parent material situated atop bedrock. The interstitial cracks between the individual pieces of regolithic limestone are filled with a yellowish red clay similar to that of the B3.

TP 3, although not excavated below 20 cm., may have been placed in an area of Dwight soils. The A1 horizon in TP 3 was 9-17 cm. thick, much thinner than observed in TP 1, but within the range of Dwight soils. A primary difference between Dwight and Labette soils is the thinner A1 horizon of the former (U.S.D.A. 1975:9).

Relative Dating

In the absence of dateable organic material, projectile point morphology

is the sole means of determining the relative age or cultural affiliation of 14BU89's cultural deposit. Three of the five projectile points recovered from the site are illustrated in Figure 3.25. All five artifacts represent stemmed projectile points comparable to those of the El Dorado phase Archaic, as defined by Grosser (1973) at the Snyder site, 14BU9. At 14BU89, both straight bases (Fig. 3.25c) and concave bases (Fig. 3.25a) are represented. These basal shapes are replicated in the El Dorado phase material from the Snyder site; in addition, the straight based forms are similar to points from 14BU81 (this chapter, Fig. 3.12).

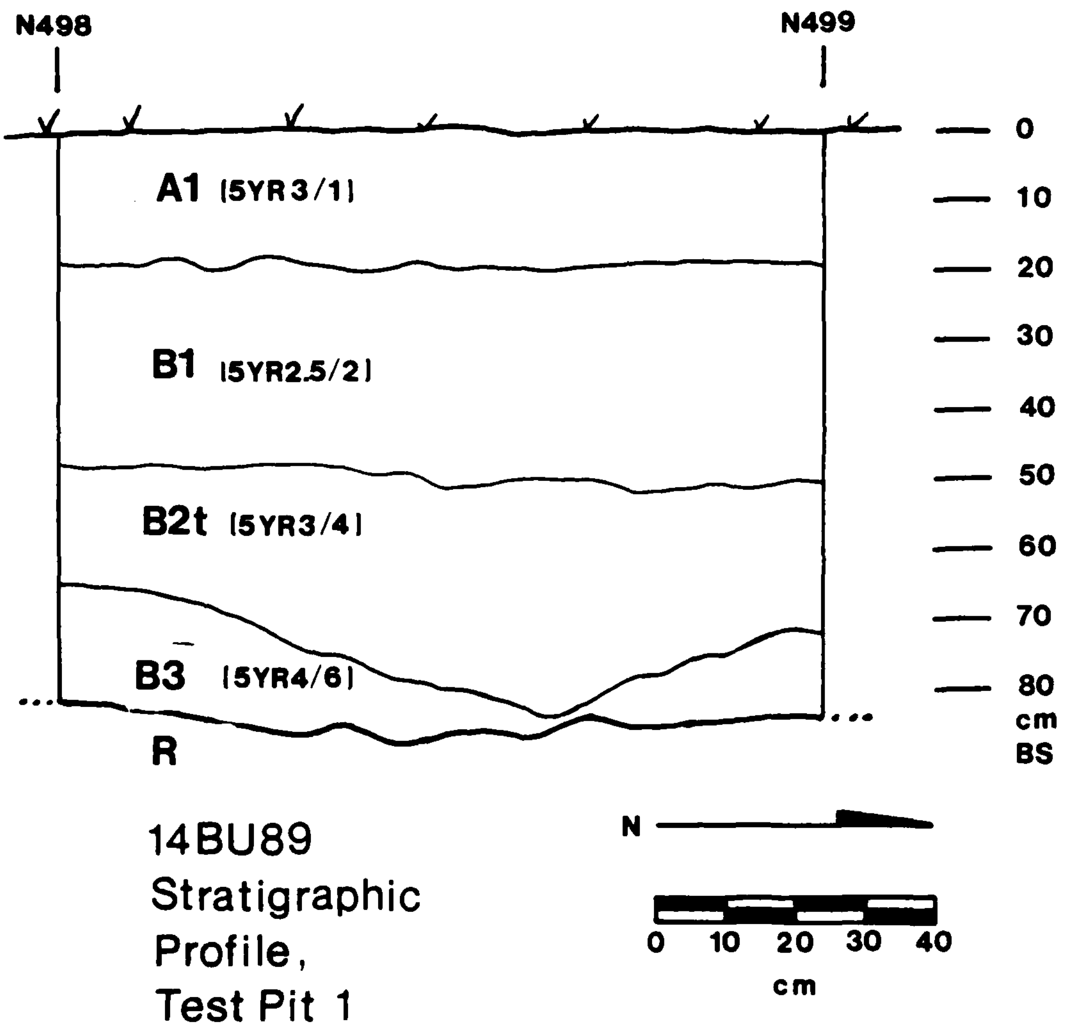

Figure 3.24. Stratigraphic profile of TP 1, 14BU89. Horizon designations are those of the Labette series (U.S.D.A. 1975).

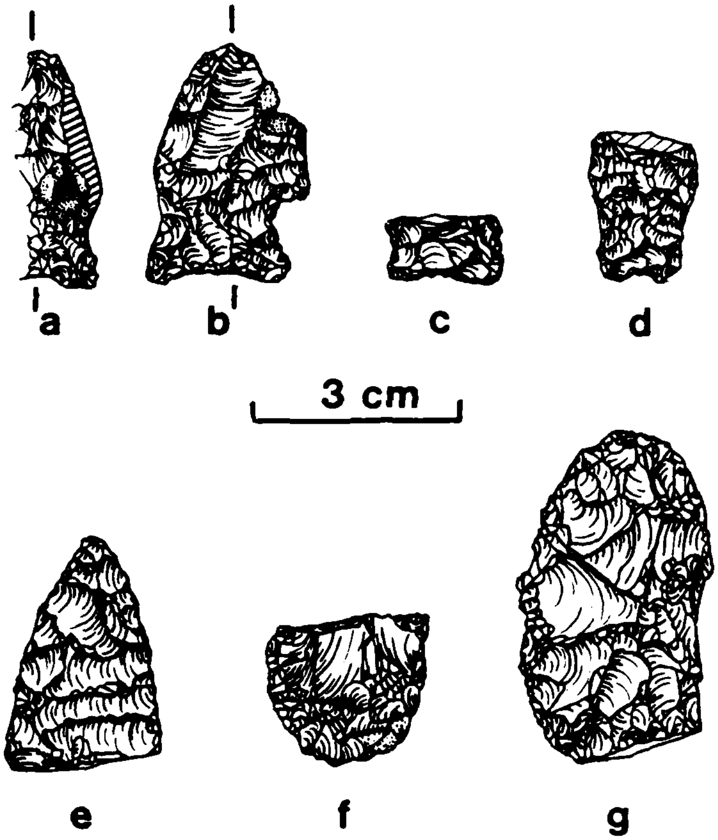

Figure 3.25. Shaped tools from 14BU89: (a-b) complete, concave-based points, partial and full views of obverse sides; (c) slightly concave-based proximal point fragment; (d) stemmed, shoulderless biface; (e) thin, acute-edged biface; (f) proximal preform fragment; (g) thick biface fragment.

The fifth projectile point from 14BU89 (Fig. 3.25d) is the basal fragment of a narrow, shoulderless artifact possessing a slightly contracting stem ending in a straight base. Although Grosser (1970, 1973) discusses no similar artifacts from 14BU9, the fragment is probably indicative of an Archaic occupation. In stem morphology, it resembles projectile points from both 14BU81 and 14BU9; it differs from these points only in lacking shoulders.

Thus, the projectile points on 14BU89 provide no evidence of cultural affiliation other than El Dorado phase Archaic, which at the Snyder site is associated with radiocarbon dates ranging from 3240 ± 85 B.P. to 3980 ± 100 B.P. The mixture of concave and straight bases suggests a utilization of the site through much of this time span.

Artifact Analysis

Artifacts from 14BU89, although believed to be indicative of a single archeological component, may be grouped into five subassemblages based on provenience and sampling techniques. All materials collected from the trail ruts using a grab surface technique are considered as one sample. This includes artifacts from both the 1977 and 1978 investigations. Material recovered by transect interval sampling is also combined into one sample, which may be regarded, in effect, as a systematic surface collection. Finally, the material recovered from each test square is considered separately. Although identical excavation techniques were used in each square, it is desirable to present each test pit's contents separately in order to observe intrasite patterning in the cultural deposit. The distribution of artifacts among these subassemblages is presented in Table 3.24. Chipped

Table 3.24. Distribution of raw materials among provenience units, 14BU89.

Raw Material	Trail Surface	Transect Samples	TP 1	TP 2	TP 3	Total
Chipped Stone	660	43	121	26	121	971
Sandstone	1	-	-	-	-	1
Limestone	2	-	4	-	-	6
Shell	2	-	-	1	-	3
Quartzite	1	-	-	-	-	1
Total	666	43	125	27	121	982

stone artifacts comprise 99% of the entire assemblage. Other materials including sandstone, limestone, shell and quartzite are very sparsely represented.

One piece of relatively dense, dark brown sandstone was recovered from the site surface. The artifact is tabular in form, exhibiting two plane, parallel surfaces. Thickness, measured perpendicularly to these surfaces, is 21 mm. The functional surface (35 mm. in its maximum dimension) is identified by its smoothness, relative to the opposite face, implying that it was ground, perhaps by use in grinding or pulverizing tasks. The surface has no grooves to suggest repeated use as an abrader in biface manufacture.

Six specimens of limestone were recovered, two from the surface and four from TP 1. One specimen, from the surface, exhibits reddish discoloration suggesting thermal alteration. The sparsity of limestone, given the

site's proximity to natural outcrops, indicates that the use of this material was not important to the site's prehistoric occupants.

Three small fragments of mollusc shell, two from the surface and one from TP 2 were recovered, the largest of which is 2 cm. in maximum diameter. Since the Walnut River is relatively close to the site, it is probable that the shells were transported to the blufftop by natural predators.

Quartzite is represented at 14BU89 by one small flake fragment, weighing 1.2 gm., from the site surface. Although it is possible that the flake was intentionally produced, it is also conceivable that the flake was unintentionally struck from an object such as a hammerstone during use. The absence of either quartzite hammerstones, or quartzite cores, or tools precludes definitive evaluation of these alternatives.

Weathered chert, a material commonly occurring at most sites in the El Dorado Lake area, is absent from the 14BU89 assemblage, although the material is a common natural occurrence in the uplands of the project area. Weathered chert occurring in the archeological record is postulated to have served multiple functions, including use as hearthstones, or as grinding or pulverizing implements. Its absence from 14BU89 implies either the absence of such activities at the site, or alternatively, that such artifacts were transported from the site at the end of each occupation.

A total of 974 chipped stone artifacts were recovered from 14BU89, 660 of which were collected from the vehicle trail. Complete tabulations of technoclass, chert type and thermal alteration of chipped stone from each provenience unit subassemblage are provided in Tables 3.25-3.29.

Table 3.25. Data on chipped stone chert types and thermal alteration, 14BU89 surface.

	Florence A		Florence B		Light Gray		Ind./Misc.		Total	
Technoclass	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
Core	-	1	-	2	-	-	-	-	-	3
total:	1		2		-		-		3	
Cortical Chunk	-	7	1	6	-	-	1	14	2	27
total:	7		7		-		15		29	
Decor. Flake	3	33	-	17	-	3	-	15	3	68
total:	36		17		3		15		71	
Int. Flake	26	84	35	174	-	27	51	37	112	322
total:	110		209		27		88		434	
Noncor. Chunks	6	8	2	21	-	-	2	17	10	46
total:	14		23		-		19		56	

Table 3.25. (Continued)

Technoclass	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Light Gray Heat	Light Gray No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total Heat	Total No Heat
Bif. Trim. Flake	1	9	3	16	-	4	1	5	5	34
total:	10		19		4		6		39	
Shaped Tools	-	8	2	6	-	-	2	6	4	20
total:	8		8		-		8		24	
Thermo. Shatter	-	-	-	-	-	-	4	-	4	-
total:	-		-		-		4		4	
TOTAL	36	150	43	242	-	34	61	94	140	520
total:	186		285		34		155		660	

Table 3.26. Data on chipped stone chert types and thermal alteration, 14BU89 Transect samples.

Technoclass	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Light Gray Heat	Light Gray No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total Heat	Total No Heat
Core	-	-	-	1	-	-	-	-	-	1
total:	-		1		-		-		1	
Cortical Chunks	-	-	-	-	-	-	1	-	1	-
total:	-		-		-		1		1	
Decor. Flakes	-	-	-	4	-	-	-	-	-	4
total:	-		4		-		-		4	
Int. Flakes	4	10	4	8	-	2	1	2	9	22
total:	14		12		2		3		31	
Noncor. Chunks	1	-	-	-	-	-	-	1	1	1
total:	1		-		-		1		2	
Bif. Trim. Flakes	-	4	-	-	-	-	-	-	-	4
total:	4		-		-		-		4	
TOTAL	5	14	4	13	-	2	2	3	11	32
total:	19		17		2		5		43	

Table 3.27. Data on chipped stone chert types and thermal alteration, 14BU89, Test Pit 1.

	Florence A		Florence B		Light Gray		Ind./Misc.		Total	
Technoclass	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
Core	-	-	-	1	-	-	-	-	-	1
total:	-		1		-		-		1	
Cortical Chunk	-	-	1	1	-	-	2	2	3	3
total:	-		2		-		4		6	
Decor. Flake	-	1	-	2	-	1	-	2	-	6
total:	1		2		1		2		6	
Inter. Flake	4	16	1	44	-	4	1	14	6	78
total:	20		45		4		15		84	
Noncor. Chunk	-	2	-	2	-	2	-	1	-	7
total:	2		2		2		1		7	
Bif. Trim. Flake	-	-	1	5	-	1	-	2	1	8
total:	-		6		1		2		9	
Shaped Tool	-	-	1	-	-	-	-	-	1	-
total:	-		1		-		-		1	
Therm. Shatter	-	-	-	-	-	-	7	-	7	-
total:	-		-		-		7		7	
TOTAL	4	19	4	55	-	8	10	21	18	103
total:	23		59		8		31		121	

Table 3.28. Data on chipped stone chert types and thermal alteration, 14BU89, Test Pit 2.

Technoclass	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Light Gray Heat	Light Gray No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total Heat	Total No Heat
Decor. Flakes	-	-	-	1	-	-	-	-	-	1
total:	-		1		-		-		1	
Inter. Flakes	6	8	2	2	1	1	-	1	9	12
total:	14		4		2		1		21	
Bif. Trim. Flakes	1	-	1	1	-	-	-	-	2	1
total:	1		2		-		-		3	
Thermo. Shatter	-	-	-	-	-	-	1	-	1	-
total:	-		-		-		1		1	
TOTAL	7	8	3	4	1	1	1	1	12	14
total:	15		7		2		2		26	

Table 3.29. Data on chipped stone chert types and thermal alteration, 14BU89, Test Pit 3.

Technoclass	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Light Gray Heat	Light Gray No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total Heat	Total No Heat
Cortical Chunks	-	-	-	-	-	-	-	1	-	1
total:	-		-		-		1		1	
Decor. Flakes	-	2	-	6	-	-	-	1	-	9
total:	2		6		-		1		9	
Inter. Flakes	14	30	8	36	-	6	1	5	23	77
total:	44		44		6		6		100	
Noncor. Chunks	-	1	-	-	-	-	2	-	2	1
total:	1		-		-		2		3	
Bif. Trim. Flakes	1	2	1	2	-	-	-	-	2	4
total:	3		3		-		-		6	
Thermo. Shatter	-	-	-	-	-	-	2	-	2	-
total:	-		-		-		2		2	
TOTAL	15	35	9	44	-	6	5	7	29	92
total:	50		53		6		12		121	

The frequency of chert types and thermal alteration varies considerably among subassemblages. Tables 3.30 and 3.31 present absolute and relative frequencies of chert types and thermal alteration within the five subassemblages. Percentage frequencies, which facilitate intersample comparisons, are portrayed graphically in Figure 3.26.

As shown in Table 3.30 and Figure 3.26, the two varieties of Florence chert are the most numerous materials in all subassemblages. The relative proportion of Florence A and Florence B, however, varies between units. In the vehicle trail surface collection, and in TP 1 (Fig. 3.26a,c), Florence B was more abundant than Florence A. In TP 3 and the transect samples (Fig. 3.26b,e), the two are proportionally equivalent, while in TP 2 (Fig. 3.26d), Florence A is more abundant than Florence B. Flint Hills light gray was represented in minimal proportions (ranging from 4.7% to 7.7%; Table 3.30) in all subassemblages. The proportion of indeterminate/miscellaneous chert varied considerably, from 7.7% to 25.6% (Table 3.30).

The frequency of thermal alteration of chert types was somewhat more consistent between samples. As shown in Table 3.31, the percentage frequency of thermally altered specimens ranged from 20-25% of the subassemblage totals in the surface collection, transect samples, and TP 3. Proportionately fewer

Table 3.30. Frequency of chert types within subassemblages, 14BU89.

Subassemblage	Florence A	Florence B	Flint Hills Light Gray	Ind./ Misc.	Total
Surface	185 (28.2)[a]	285 (43.2)	34 (5.2)	155 (23.5)	659 (100.0)
Trans. Samples	19 (44.2)	17 (39.5)	2 (4.7)	5 (11.6)	43 (100.0)
TP 1	23 (19.0)	59 (48.8)	8 (6.6)	31 (25.6)	121 (100.0)
TP 2	15 (57.7)	7 (26.9)	2 (7.7)	2 (7.7)	26 (100.0)
TP 3	50 (41.3)	53 (43.8)	6 (5.0)	12 (9.9)	121 (100.0)

[a]Percentage of total subassemblage (row percentage) listed in parentheses.

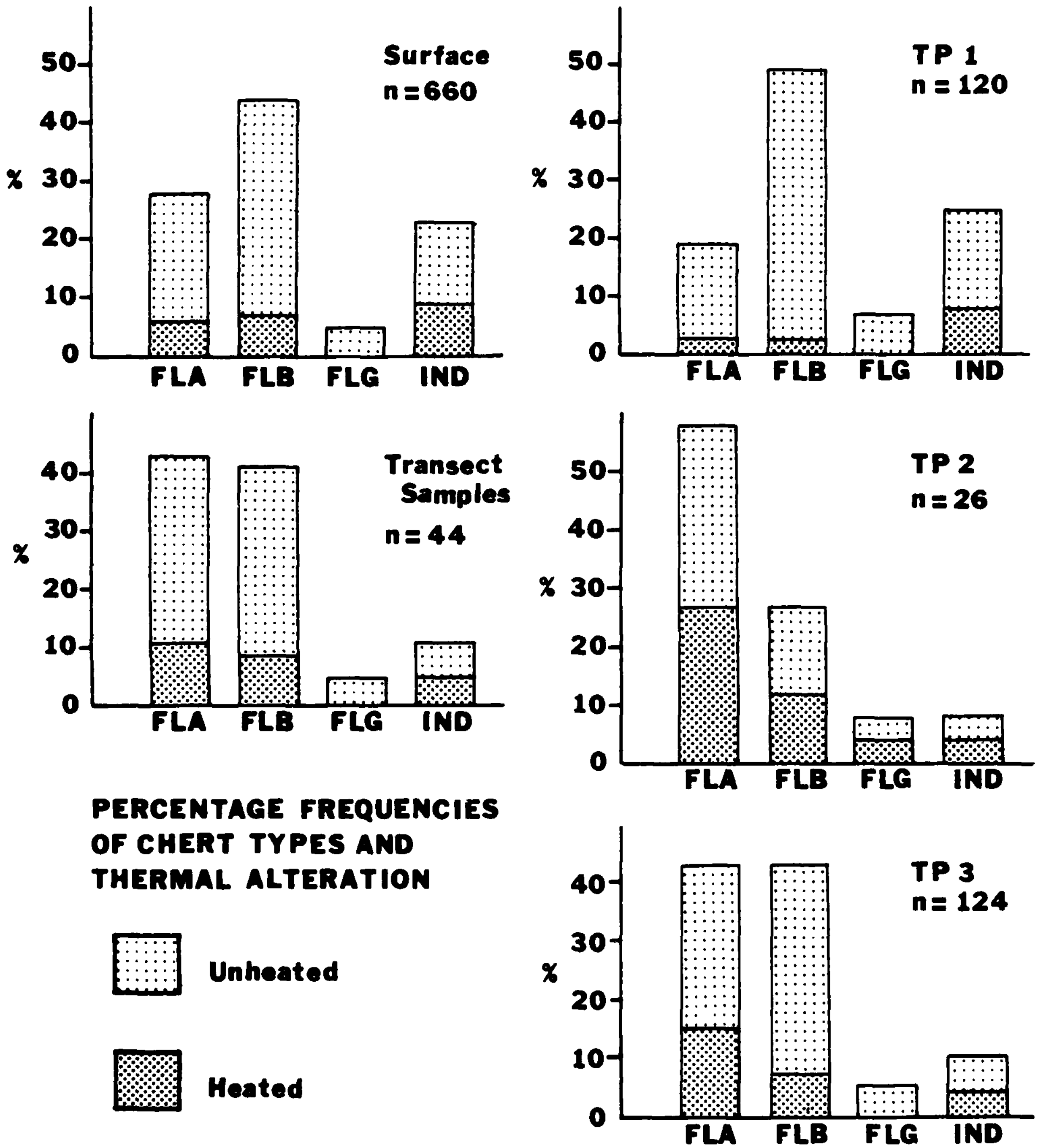

Figure 3.26. Variation in relative frequency of chert types and thermal alteration within the five subassemblages from 14BU89.

Table 3.31. Frequency of thermal alteration of chert types within subassemblages, 14BU89.

Subassemblages	Florence A	Florence B	Flint Hills Light Gray	Ind./ Misc.	Total
Surface	36 (5.5)[a]	43 (6.4)	-	61 (9.1)	140 (21.0)
Trans. Samples	5 (11.6)	4 (9.3)	-	2 (4.7)	11 (25.6)
TP 1	4 (3.3)	4 (3.3)	-	10 (8.3)	18 (14.9)
TP 2	7 (26.9)	3 (11.5)	1 (3.8)	1 (3.8)	12 (46.0)
TP 3	15 (12.4)	9 (7.4)	-	5 (4.1)	29 (23.9)

[a]Percentage of total subassemblage (including altered and unaltered).

(14.9%) of elements from TP 1 were thermally altered, while almost half (46.2%) of all chipped stone from TP 2 was heated. In general, evidence for thermal alteration of chert is not abundant in the subassemblages. The only exception to this is TP 2, although the smallness of the sample obtained from this unit largely precludes explanation of this anomaly.

In the surface collection, the transect samples and TP 1, heat treated Florence A and Florence B are present in almost equal percentages of the whole subassemblage, despite the considerable variation in relative proportion of the two cherts (Fig. 3.26). In TP 2 and TP 3, although the proportion of Florence A and Florence B varies between the subassemblages, thermally altered Florence A is present in equivalently higher percentages than Florence B. In both samples, the ratio of thermally altered Florence A to Florence B is approximately 2:1 (7:3 in TP 2; 15:9 in TP 3).

Of the 52 specimens of Flint Hills light gray recovered from 14BU89, only one specimen was thermally altered. This may imply that thermal alteration was applied even less frequently to this material than to other chert types at the site.

Because of variability among subassemblages, it is difficult to assess the overall relative frequency of chert types and thermal alteration at 14BU89. Given the relatively small sizes of excavated samples, it is not inconceivable that some of the variation is due to sampling error. However, it is equally likely that, given the relatively large dispersal

of sampling units over the site, the variation may represent cultural patterning in the utilization of lithic materials. Further investigation would be required to evaluate these alternatives.

As shown in Table 3.32, a full range of technological activities is represented at 14BU89, from the initial reduction of raw material (cortical elements), through intermediate stages (cores, intermediate elements) to final shaping (trimming flakes, shaped tools).

Although the presence of cortical elements indicates that chert was brought to the site in relatively unaltered forms, there is evidence for the initial reduction of large pieces of lithic material. As shown in

Table 3.32. Absolute and relative frequencies of chipped stone technoclasses, 14BU89.

Technoclasses	Trail Surface	Transect Samples	TP 1	TP 2	TP 3
Core	3 (0.5)[a]	1 (2.3)	1 (0.8)	-	-
Cortical Chunk	29 (4.4)	1 (2.3)	6 (5.0)	-	1 (0.8)
Decortication Flake	71 (10.7)	4 (7.0)	6 (5.0)	1 (3.8)	9 (7.3)
Intermediate Flake	434 (65.8)	31 (72.1)	83 (69.2)	21 (80.8)	103 (83.1)
Noncortical Chunk	56 (8.5)	2 (4.7)	12 (10.0)	-	3 (2.4)
Bifacial Trimming Flake	39 (5.9)	4 (9.3)	9 (7.5)	3 (11.5)	6 (4.8)
Shaped Tool	24 (3.6)	-	1 (0.8)	-	-
Thermoclastic Shatter	4 (0.6)	-	2 (1.7)	1 (3.8)	2 (1.6)
Total	660 (100.0)	43 (100.0)	120 (100.0)	26 (100.0)	124 (100.0)

[a]Percentage of sample listed in parentheses.

Table 3.33, the mean weights of cortical chunks (5.70 gm.) and decortication flakes (3.47 gm.) are relatively small, especially by comparison with 14BU81, where the mean weights of cortical chunks and decortication flakes were 53.56 gm. and 9.92 gm., respectively (this chapter, Table 3.12).

Florence A decortication flakes tend to be smaller than Florence B decortication flakes, as indicated by mean weights (Table 3.33). This may mean that Florence A chert was brought to the site in smaller pieces than Florence B chert. Although noncortical and cortical Florence A chunks exhibit higher mean weights than Florence B chunks, it is significant that these include the largest pieces of Florence A chert present on the site. Florence B chert, on the other hand, is represented by several fairly large alluvial cobbles which were preliminarily shaped into cores (see below). There are no similarly sized specimens of Florence A chert.

Only three heat treated decortication flakes (of Florence A chert and from the surface collection) were observed in the assemblage. Five thermally

Table 3.33. Mean weight of various chipped stone technoclasses, 14BU89.

Provenience/ Technoclass	Mean Weight (gm.) Florence A	Florence B	Flint Hills Light Gray	Ind./ Misc.	Total
SURFACE					
Cortical Chunks	9.89	4.23	-	4.43	5.70
Decortication Flakes	2.23	6.76	6.13	2.15	3.47
Intermediate Flakes	0.75	0.67	0.86	0.71	0.72
Noncortical Chunks	3.37	3.13	-	1.47	2.63
Bifacial Trimming Flakes	0.40	0.93	1.68	0.90	0.86
EXCAVATED					
Cortical Chunks	-	0.30	-	1.38	1.10
Decortication Flakes	1.93	2.57	1.60	1.27	2.23
Intermediate Flakes	0.33	0.65	0.99	0.21	0.50
Noncortical Chunks	1.90	1.05	1.85	0.76	1.56
Bifacial Trimming Flakes	0.34	0.26	0.50	0.25	0.30

altered cortical chunks are present, two from TP 1 and three from the surface collection. This suggests that thermal alteration was not a significant part of initial lithic reduction at 14BU89.

Five cores were recovered from the site, three from the site surface, one from TP 1 and one from a transect sample located 20 m. east of TP 1. One core (from the surface) is of Florence A chert, while the remainder are of Florence B. None have been thermally altered.

The Florence A core is discoidal in shape, exhibiting a biconvex to rhomboidal cross section. Flakes were struck from both surfaces, originating at the lateral margins and terminating near the center. In the removal of flakes from either surface, the opposite surface was used as a platform. The cross sectional thickness of the core is 30 mm., and the greatest diameter orthogonal to the axis of thickness is 52 mm.

Of the four cores of Florence B chert, three represent patinated cobbles exhibiting little or no preparation or shaping. One specimen, recovered from the site surface, was discoidally worked along one margin, but was discarded before assuming a completely discoidal shape. A second core, recovered from a transect sample 20 m. east of TP 1, was flaked from a single cortical platform along one nodular surface. The third core is a fragment of a larger nodule. Only one flake scar is preserved, and it originates from a previously flaked surface.

The fourth Florence B core, recovered from TP 1 is a core rejuvenation flake, removed from the original core by a blow directed both transversely and down from the point of impact at the edge of the platform. As a result, a portion of the platform and flaked surfaces were removed. The absence of flake scars on the platform indicates that the core was not discoidal. The specimen, therefore, provides evidence for a second type of shaped core at 14BU89, differing from the discoidal form discussed above.

The mean weights of intermediate flakes from 14BU89 (Table 3.33), in both surface and excavated materials and for all chert types, are less than a gram. It might be suggested that the smallness of flakes in the surface collection represents high breakage rates attributed to their exposure in ruts of a well-traveled vehicle trail. The even smaller sizes of intermediate flakes from undisturbed portions of the site, however, indicates that this is not necessarily so. On the other hand, it might be the case that all flakes on the site have been subjected to high breakage rates by pedological processes operative in the surface horizons of the prairie soils. Shallow burial of the materials would expose them to the effects of frost-heaving, while the shrinking and swelling of the heavy clay upland soils would also have contributed to flake attrition.

The small size of intermediate flakes on 14BU89 could also be attributed to an emphasis at the site on bifacial tool manufacture or maintenance, which could result in the production of many small flakes. The posited emphasis on bifacial tool manufacture or maintenance has two implications, which are explored below. First, a high incidence of bifacial trimming flakes should be observed in the assemblage, and, second, substantial numbers of

partially shaped and broken bifaces should be present.

Table 3.32 shows the percentage of bifacial trimming flakes per provenience unit subassemblage to vary from 4.8% in TP 3 to 11.5% in TP 2. The technoclass is generally better represented in excavated than surface proveniences, with the exception of TP 3. In that bifacial trimming flakes are generally small in size, their underrepresentation in a grab surface collection, relative to excavated materials, is to be expected.

The incidence of bifacial trimming flakes at 14BU89 is somewhat higher than at 14BU81. Percentage frequency of this technoclass in the 14BU81 surface collection and Unit I excavated assemblages were 3.7% and 4.7%, respectively (this chapter, Tables 3.11 and 3.18). At 14BU16 (this chapter, Table 3.3), bifacial trimming flakes comprised only 2.5% of the assemblage. Bifacial trimming flakes thus have comparatively high representation at 14BU89, indicating that the manufacture or maintenance of bifacial tools was a more prevalent site activity than at either 14BU81 or 14BU16.

Twenty-five shaped bifacial tools were recovered from 14BU89, all but one of which were obtained from the site's surface (Table 3.30). These artifacts are subdivided as follows:

I. Projectile points. n=5

II. Preforms and/or light-duty bifaces. n=9

III. Partially shaped bifaces. n=2

IV. Miscellaneous fragments. n=9

Additional data on chert types and thermal alteration of these artifacts is presented in Table 3.34.

Table 3.34. Chert types and thermal alteration of shaped tools, 14BU89.

Category	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total
Projectile Points	-	1	2	1	1	-	5
Preforms/Light-Duty Bifaces	-	3	1	2	1	2	9
Partially Shaped Bifaces	-	-	-	2	-	-	2
Miscellaneous Fragments	-	4	-	1	-	4	9
Total	-	8	3	6	2	6	25

Of the five projectile points from 14BU89, four are proximal fragments of stemmed points. Two of these are straight based, with a slightly expanding flare at the base of the stem. Both are of Florence B chert. One specimen is thermally altered and possesses no rounding or grinding at the basal edge. The second specimen lacks thermal alteration, but the basal edge has been abraded to a smooth, rounded edge, presumably to facilitate hafting (Frison 1974:83).

The proximal fragment illustrated in Figure 3.25c is fashioned from thermally altered Florence B chert and possesses a concave base. Edge rounding is apparent, but has been partially obliterated by crushing in the form of step faceting on one lateral and the basal margins. Whether this crushing is also a hafting modification, or whether it developed through friction of the artifact in a socket during use is not known.

The fourth proximal fragment (Fig. 3.25d) represents the slightly contracting stem of a shoulderless projectile point of unheated Florence A chert. The base exhibits a slight concavity as the result of basal thinning. No edge rounding is apparent, although both lateral stem margins exhibit edge crushing in the form of step facets.

All four proximal fragments evince a specialized form of lateral snap in which the fracture breaking the artifact hinges from the fracture surface onto a face of the artifact, forming a small flute or tongue-shaped flake scar (Fig. 3.25c). Frison (1974:96-97) attributes similar fractures to impact, perhaps indicating the breakage of these artifacts during use as projectile tips.

One relatively complete projectile point (Fig. 2.25a,b) was recovered from 14BU89. Of an unidentified, thermally altered chert, the point has a broad neck with a wide, concave base. The base and one lateral margin of the stem exhibits edge rounding. Rounding on the opposite lateral margin extends only a short distance from the base, at which point it is obliterated by crushing. The absence of edge rounding on the intact margins of the point's blade element provides some evidence that the observed edge preparation on the stem was a hafting modification and not a manufacturing stage. A long, flute-like impact fracture is present, extending from the tool's tip to the juncture of the blade and haft elements. The fracture surface possesses pronounced flake ripples, which, together with the scar's length, suggests that heavy impact resulted in the artifact's breakage.

Only one lateral margin of the tool is intact. The opposite margin was removed by a long burin-like facet which originated from near the tip of the artifact and terminated at the stem, completely removing the blade's lateral edge and shoulder. Although this removal may have resulted from impact (as illustrated by Frison 1974:96), it may also have been intentionally produced in an attempt to rejuvenate the tool's edge. Close examination of the artifact's extreme tip reveals multiple small impact fractures, providing further evidence for the tool's breakage as a result of use as a projectile.

Artifacts categorized as preforms or light-duty bifaces are further divisible according to tool condition and cross sectional characteristics.

Employing these criteria, one artifact (not illustrated) may be described as a medial fragment of a biconvex specimen which is rather narrow (13 mm.) relative to its thickness (5 mm.). Although this width to thickness ratio is within the range of straight based projectile point stems from 14BU9 and 14BU81, the specimen is not classified with projectile points because it lacks the edge crushing and rounding observed on all other points from 14BU89.

Three artifacts are classified as proximal preform fragments. Two of these are biconvex specimens of unheated Florence B chert, with thicknesses of 8 and 9 mm. One has a straight basal margin, while the other possesses an ovate margin. Neither exhibits edge rounding or crushing. The ovate based artifact's unfinished state is demonstrated by the large, relatively unflaked area in the center of the tool (Fig. 3.25e).

The third proximal fragment is thinner (5 mm.) than the two previously discussed, and exhibits finer retouch. The base and lateral margins of the preform are straight, meeting to form a square corner. The opposite lateral margin is not present. Both observable margins are rounded, except for a segment of the lateral margin, which has been retouched to form an incomplete notch, suggesting that the speciman represents a preform fragment broken in the process of final shaping. The placement of the notch suggests that a stem, such as evidenced on several straight based projectile forms from the site was being produced. The specimen is of a thermally altered, unidentified chert.

Three artifacts are described as distal or medial fragments of thin, acute edged bifaces. The single distal fragment (Fig. 3.25f) exhibits acuminate lateral edges and is fashioned from an unheated, unidentified chert. The piece is 4.9 mm. thick and has edge angles of 30^{o}.

Two medial fragments probably represent artifacts similar to that described above. The first of these, fashioned from an unheated, unidentified gray-white chert, is 5.5 mm. thick and has edge angles of 25^{o} to 30^{o}. The artifact's two lateral edges are convergent in relation to one another, suggesting that the complete artifact was acuminate.

The second medial fragment, of unheated Florence A chert, consists of a portion of the lateral edge of an artifact whose thinness (4.0 mm.) and acute edge angle (37^{o}) suggests similarity with the two just discussed. The thin cross sections, acute edges, and relatively finished appearance of these artifacts suggest that they represent completed, utilitarian objects rather than preforms. They are distinctive from the point forms present on the site in cross section. They would have functioned adequately as cutting tools, possibly for light butchering.

Two relatively thick, biconvex biface fragments of unheated Florence A chert were recovered from 14BU89 (Fig. 3.25g). Neither tool is extensively finished, and were probably used as light-duty cutting or butchering tools.

Two partially shaped bifaces from 14BU89 represent artifacts used or discarded before extensive shaping or bifacial thinning occurred. One shows no evidence of use, and is most likely a manufacturing reject, since one

face possesses a large area of remnant cortex. The other artifact was roughly shaped into a discoidal form, and used in a heavy chopping task, which resulted in extensive faceting on one edge. Both surfaces of the tool are polished, suggesting that the tool penetrated deeply into the material being worked. No hafting modifications are recognized, although the tool might conceivably have been hafted in a broad socket. Both partially shaped bifaces are of unheated Florence B chert.

The nine miscellaneous biface fragments are evenly divided between Florence A and unidentified cherts, with one specimen of Florence B also present. These artifacts represent the debris of early stages of manufacture at the site, since none exhibit extensive shaping or fine retouch. No thermal alteration is observed within this category.

Regarded as a whole, the shaped tools from 14BU89 are evenly distributed among Florence A, Florence B, and unidentified cherts, although about half of the specimens of the latter two types are categorized among the miscellaneous fragments (Table 3.29). If this category is excluded, then eight of the 16 remaining artifacts are fashioned of Florence B chert, including three of the five projectile points, both partially shaped bifaces, and two of the three artifacts recognized as proximal preform fragments.

Bifacial trimming flakes recovered from the site represent either biface manufacture or curation. Additional evidence for curation behavior at 14BU89 is provided by the fact that five of the six projectile points are hafting element fragments, suggesting that projectiles broken beyond the boundaries of the site (while hunting, for example) were returned to the site and refitted with new points, the broken haft being discarded (Judge 1973:83).

The absence of Flint Hills light gray tools at 14BU89 is worthy of note, since bifacial trimming flakes of the material occurred in all provenience unit samples. This indicates that, although light gray chert bifaces were occasionally brought to the site, used and curated, their loss or discard did not occur, at least with a frequency detectable by the archeological techniques employed at the site.

The same inference is possible regarding the on-site use of quartzite tools. The single quartzite flake recovered suggests that objects of the material were present on the site, but on-site discard or loss was infrequent.

It is probable that many tools were brought to the site, used, and perhaps curated on the site, then taken away, leaving no evidence of their presence other than chippage. Tools were discarded only when broken or (as in the case of one partially shaped biface which exhibited no breakage) extensively used.

Activities evidenced in the site assemblage include hunting (inferred from the presence of basally fragmented and impact fractured projectile points) and light to heavy cutting or butchering tasks (indicated by various forms of bifacial tools exhibiting functional cutting or penetrating edges). The 36 retouched flakes recognized in the assemblage possessed 40 retouched edges. Eighteen edges exhibited a suitability for cutting tasks. In

addition, nine steeply angled scraping edges, eight notched edges and two denticulate edges were observed. A cutting and a scraping edge occurred in combination on three flakes, while one artifact exhibited a scraper and notched edge in combination. In general, scraping edges tended to show intensive use, suggesting their use on fairly resistant materials, such as wood. This suggests that the on-site curation of hunting weapons, evidenced by the presence of proximal point fragments, also may have included the curation of wooden projectile shafts.

Absent from the assemblage is evidence of plant food processing, in the form of weathered chert artifacts or tools exhibiting silica polish. One piece of sandstone recovered from the site exhibits plane surfaces and might have been used in a grinding or pulverizing task, although there is no evidence that the material worked was vegetable matter.

All of the above observations might reasonably be expected of a site in the topographic context of 14BU89. The site's primary attraction to prehistoric groups undoubtedly was its commanding view of both the valley to the east and the upland prairie to the west. Judge (1973:209), in discussing Paleo-Indian settlement behavior, operationally distinguished two types of sites associated with the hunting activities of Folsom groups. The first of these he termed "armament" or "staging" sites, implying that from them, groups prepared for the hunt. Judge recognizes such sites by the presence of projectile point preforms, indicating weapon manufacture, and by the location of the site at a spot offering an overview of surrounding terrain. The second type of site, termed "processing sites," are characterized by a low frequency of preforms and a somewhat higher incidence of basal point fragments, suggesting the on-site rehafting, but not manufacture, of points. In addition, processing site assemblages provide evidence of a greater diversity of activities, such as hide scraping, compared to armament sites.

Employing Judge's criteria for distinguishing these two site types, it is possible to classify 14BU89 as either. The occurrence of point bases and butchering tools suggests a processing site, while the site's topographic context, and the presence of bifacial manufacturing rejects suggests a staging area. It is conceivable, and probable, that the site served as both.

Discussion

Situated on a bluff top overlooking the Walnut River Valley, 14BU89 represents a late Archaic, El Dorado phase hunting camp. Investigations reported in this chapter define site boundaries as approximately 1.5 ha. in extent; it is likely that the site extends farther to the northwest, and that a total surface area of as much as 3.0 ha. might be expected. The rather large areal extent of the site does not imply that the site was occupied by large groups of people, since reoccupation of the site over long periods of time by smaller groups would also result in the accumulation of a large surface scatter. Although excavated artifact samples were too small to provide firm evidence, it is possible that the variation in chert types and thermal alteration observed at different loci on the site (Fig. 3.26) may be indicative of periodic reoccupation.

The site's topographic location implies that the site most likely represents a seasonal occupation. Occupation of the site for extended periods during cold weather may be reasonably disallowed, since the bluff top is fully exposed and would offer no natural shelter. The construction of artificial shelters may also be ruled out, since the prairie sod on 14BU89 is shallow, and is underlain by an extremely hard subsoil, which would have discouraged the setting of posts required for a substantial winter dwelling.

Thus, any extensive occupation of 14BU89 would most reasonably have occurred during warm weather. This does not preclude the site's utilization during cold weather. The site's utilization as an overview may well have been year round, but, during winter, the site would have provided insufficient shelter for an occupation of any duration.

Recommendations

Only a small portion of 14BU89 extends below the 1347.5 ft. flood pool elevation of El Dorado Lake. The extension of the site to this elevation is demonstrated by TP 3, whose placement intersected the 1347.5 ft. contour.

El Dorado Lake is predicted to reach flood pool elevation once every fifty years. At these times, the site's eastern boundary will be subjected to shoreline erosion. Since the soils over the affected portions of the site are shallow, wave action, however limited, will most likely result in the deflation of parts of the archeological deposit onto a bedrock shelf.

The lake's conservation pool, at 1340 ft., will extend nearly to the top of the bluff. Although not actually reaching the archeological deposit, the shoreline will be no more than 10 m. horizontally removed from it. Erosion of the conservation pool shoreline will be a constant factor, and will probably result in the wasting back of the limestone bluff. If, given time, this erosion becomes severe enough, portions of the archeological deposit will be threatened.

The site is completely contained within property owned by the U. S. Army Corps of Engineers. Since it is not within an area scheduled for public use, no impact of non-shoreline areas of the site is foreseen.

The significance of 14BU89 as an archeological and cultural resource may be summarized as follows:

(1) The site is the best documented upland archeological manifestation in the El Dorado Lake area, and as such, adds an essential dimension to our knowledge of the full range of prehistoric activities in the project area.

(2) The site represents occupation by groups of a single culture-historic unit, the El Dorado phase Archaic. Since the site's deposit is thus not a mixture of several groups' refuse, the reliability of behavioral inferences derived from its analysis is substantially increased. The site's identification with a cultural historical unit recognized at other sites in the project area greatly contributes to our ability to make statements about inter-site variation within the specified temporal and cultural

boundaries of that unit, which Grosser (1970, 1973, 1977) has termed the El Dorado phase. A weakness in Grosser's discussion of El Dorado cultural history is that his formulations are based on materials excavated from a single site, 14BU9 (Fulmer 1976:93). This weakness becomes especially important when the specifics of the scheme, such as the definition of "phases" (Grosser 1970, 1973) and of diachronic change in subsistence strategies (Grosser 1977) are considered. A well-grounded knowledge of these problems requires the inclusion of data from other sites, representing the greatest possible range of variability in the adaptation achieved by the area's late Archaic inhabitants. The significance of 14BU89 lies in its potential for providing data on a little known aspect of that adaptation, the utilization of the upland prairie.

For the reasons outlined above, 14BU89 is considered a significant cultural resource. Since it is not threatened by inundation, construction, or other impacts as the direct result of the construction of El Dorado Lake, further data recovery is not required, until such time as shoreline erosion is demonstrated to threaten the site. At that time, mitigation by excavation might be required. The site should be nominated to the National Register of Historic Places, and future plans for cultural resource management should consider the site.

When El Dorado Lake is completed, 14BU89 will be one of the very few archeological sites in the project area not inundated. Its significance, therefore, can only increase, and its preservation is strongly urged.

14BU87

Physical Description

Site 14BU87 is located on the floodplain of Durechen Creek, 2.9 km. northeast of the creek's confluence with the Walnut River. The site, as shown in Figure 3.27, is situated between the courses of Durechen Creek to the north and an intermittent tributary to the east; the two streams converge immediately northeast of the site.

The course of the intermittent tributary represents an abandoned channel of Durechen Creek which extends eastward along the southern edge of the floodplain for nearly a kilometer before intersecting the presently active channel. The abandoned channel remains intermittently active by capturing numerous small upland tributaries along the southern floodplain edge, thus serving as a conduit for run-off from the uplands.

The precise point of the abandoned channel's western confluence with Durechen Creek cannot be determined from modern maps and aerial photographs because of the alteration of the terrain by construction of the ATSF railroad (Fig. 3.27). It is most likely, however, that the intermittent tributary currently forming part of 14BU87's eastern boundary represents this abandoned channel.

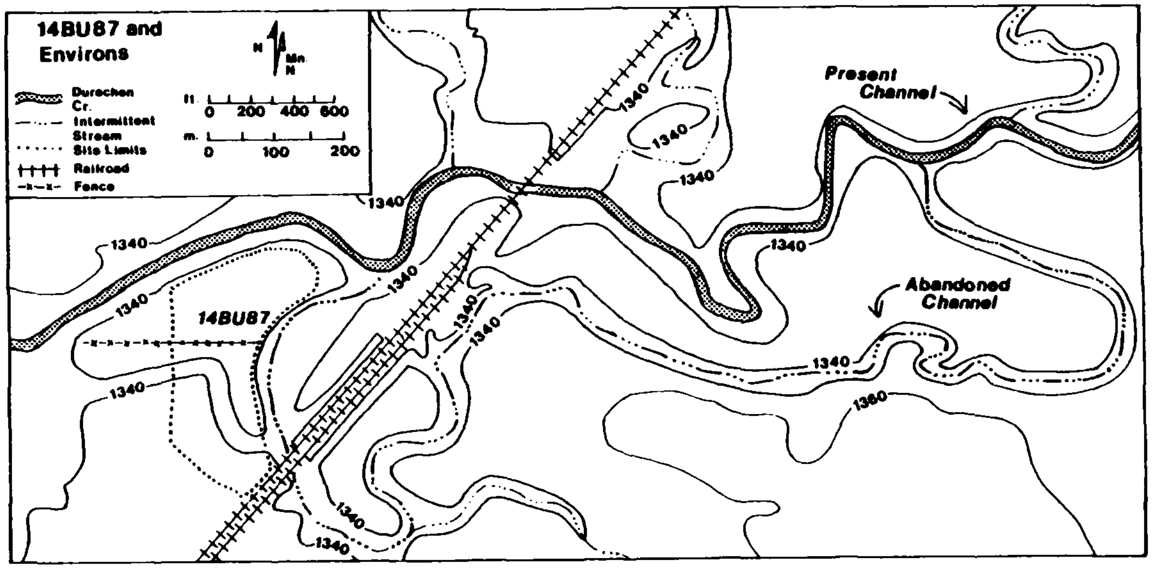

Figure 3.27. Map of 14BU87 and vicinity, showing site's location in relation to past and present channels of Durechen Creek. Based on U.S.G.S. 1:24,000 topographic maps (7.5 min. series). Contours in ft. above mean sea level.

Durechen Creek has occupied its present course in the site's vicinity since 1857, when its intersection with section lines near the site was recorded by a General Land Office survey crew. No significant variation with the present day location is discernible. Thus, the abandoned channel has not been occupied for a considerable amount of time.

Archeological Investigations

Site 14BU87 was recorded in 1977 by a University of Kansas survey crew (Root 1979:46-47). In both 1977 and 1978, the site was cultivated, providing optimal visibility for surface collection. Cultural material is distributed over an area of approximately 4.0 ha., occurring on both sides of a fence-line, which crosses the site from east to west and marks the half section line of section 34 (T24S, R6E). The surface scatter north of this fence is extremely light. In 1978, small amounts of debris were recovered from surfaces sloping eastward and northward to the active floodplain of Durechen Creek (Fig. 3.27).

The primary surface concentration is south of the fenceline, with highest densities occurring on the top and southern slope of a meander scar (Fig. 3.28) which forms an S-shaped curve across the site from northwest to southeast. Cultural materials are present in lesser quantities in the bottom of the scar, on the northern slopes and on the level surfaces north of the channel scar.

The eastern boundary of 14BU87 south of the fenceline is formed in part by the intermittent tributary, whose course is indicated by a tree line in Figure 3.28. The remainder of the site's eastern boundary is formed by the right of way of the ATSF railroad (indicated in Figure 3.28 by a fence-line). The eastern portions of 14BU87 were disturbed by the construction of a broad, relatively shallow drainage way paralleling the railroad. This depression is topographically evident in Figure 3.28.

The surface scatter on 14BU87 diminishes with distance south and west from the channel scar. No cultural material is encountered within a second meander scar 50 m. from, and essentially parallel to, the first. The second scar, therefore, forms the southern and western boundaries of the site.

Immediately northwest of the primary artifact concentration, the two channel scars merge into a broad channel remnant which drains to the south-west (see Figs. 3.27 and 3.28). This channel is devoid of cultural material and thus forms part of 14BU87's western boundary.

Based on the above boundary determinations, made initially in 1977 and verified in 1978, the primary concentration of cultural debris in the southern portion of 14BU87 covers approximately 1.8 ha. (18,000 m.^{2}), as delimited in Figure 3.28.

The 1978 investigations concentrated on the dense surface scatter along the northernmost meander scar. A reference point was established near the site's southwest margin and from it, the positions of three monument hubs

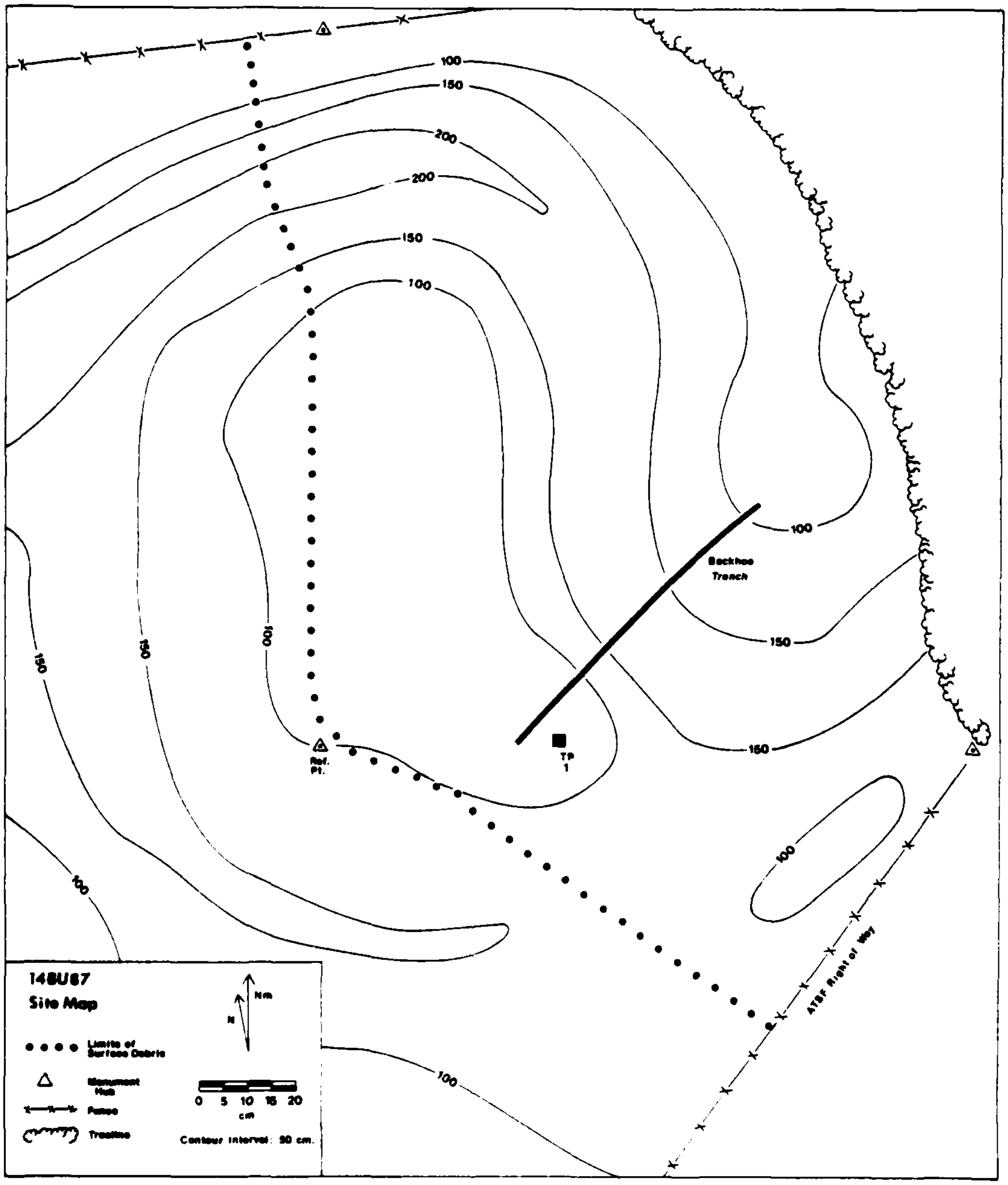

Figure 3.28. Topographic map of the investigated southern area of 14BU87. Elevations in cm. below an arbitrary reference level.

were determined. The north monument hub was placed in the fenceline crossing the site, 149 m. due north of the reference point. The south monument was located in the railroad right of way fenceline, 187 m. due south of the reference point. The east monument hub was placed 133 m. due east of the reference point, near the intersection of the railroad right of way fence and the intermittent stream's treeline (Fig. 3.28).

Test Pit 1 was established along the 500N baseline (the axis connecting the reference point with the east monument) between 48 m. and 50 m. east of the reference point. This location coincided with a concentration of cultural materials noted during earlier surface reconnaissance, and was near the edge of the northern meander scar (Fig. 3.28).

Test Pit 1 was excavated in its southern half to a depth of 90 cm., and in its northern half to a depth of 100 cm. The stratigraphic profile (Fig. 3.29) revealed three major units. The uppermost of these was a relatively shallow plow zone, very dark gray (10YR 3/1) in color, varying in thickness from 5 to 15 cm. The underlying unit was a dark yellowish brown (10YR 4/4), compact clay which was extensively mottled by root and rodent activity. Although moist and sticky when first exposed, the clay quickly dried to a hard surface. This yellowish clay unit was essentially

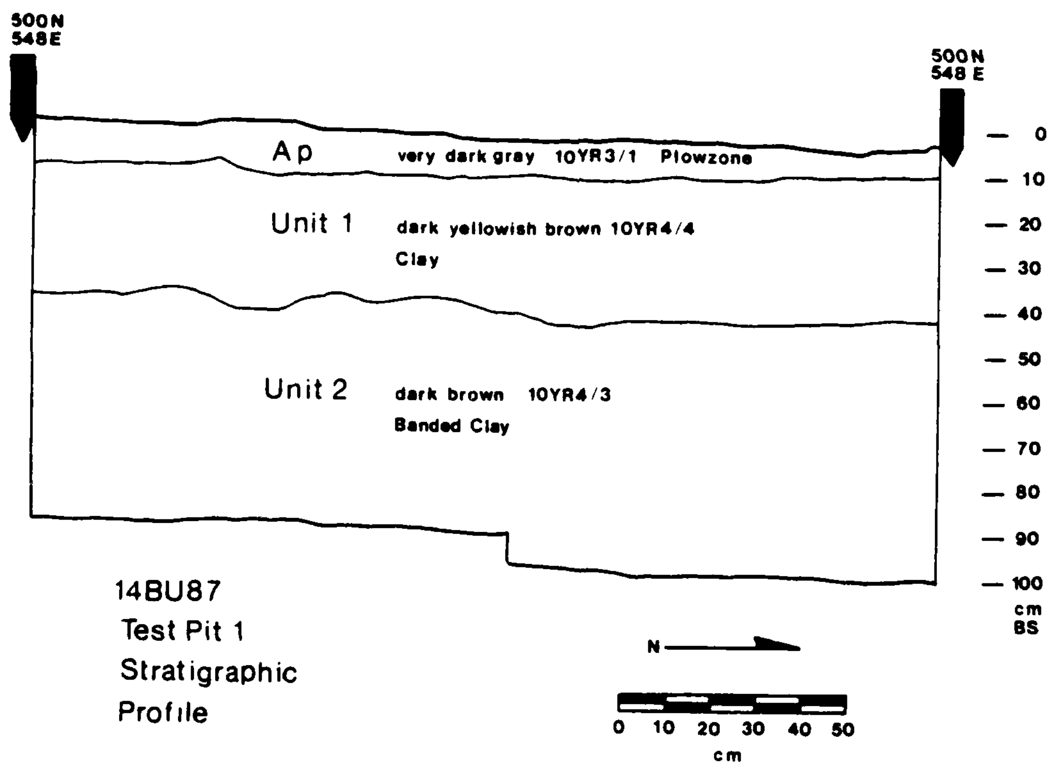

Figure 3.29. Stratigraphic profile of TP 1, 14BU87.

devoid of cultural material between 20 and 30 cm. below surface.

The thickness of the yellow clay unit varied from 37 cm. in the western half of TP 1 (NW and SW quadrants) to about 45 cm. in the eastern half (NE and SE quadrants). The contact with the underlying unit, a dark brown (10YR 4/3) silty clay, was very easily observed, not only as a cultural change, but also as a textural and structural change, the dark brown unit being significantly less compact and easier to work than the yellow clay. Concurrent with the change from yellow to dark brown clay was the appearance of burned earth, charcoal flecks and, most significantly, cultural materials.

The presence of a buried component on the site is shown in Table 3.35. The last column of this table shows the total number of chipped stone artifacts recovered from each subsurface excavation level in TP 1. Of the 51 artifacts, 37 occurred in the upper 10 cm. of the deposit. Virtually no artifacts were recovered from the yellow clay units, except in the 10-20 and 30-40 cm. levels, which were transitional to the yellow clay unit. The 20-30 cm. level yielded no material, and thus demonstrates the stratigraphic break in artifact distribution with depth. Ten artifacts were recovered from the dark brown clay unit. Although the yellow clay unit contained evidence of root and rodent disturbance, there is no direct evidence that artifacts located beneath this clay were introduced by bioturbation. First, a complete absence of artifacts in the yellow clay level would not be expected; rather, a gradual diffusion of artifacts into lower levels would

Table 3.35. Distribution of chipped stone materials and thermal alteration in TP 1, 14BU87.

Excavated Level	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Light Gray Heat	Light Gray No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total Heat	Total No Heat	TOTAL
00-10 cm. BS	17	15	1	1	-	-	1	2	19	18	37
10-20	1	1	-	-	-	-	-	-	1	1	2
20-30	-	-	-	-	-	-	-	-	-	-	-
30-40	-	1	-	1	-	-	-	-	-	2	2
40-50	-	-	-	3	-	1	-	-	-	4	4
50-60	-	-	-	2	-	-	-	-	-	2	2
60-70	-	1	-	3	-	-	-	-	-	4	4

be anticipated, as observed at 14BU16 (this chapter, Table 3.1). Second, Table 3.35 demonstrates that, despite the small samples involved, there are recognizable differences in chert types and thermal alteration between the plow zone and brown clay unit artifacts. Plow zone artifacts, half of which exhibit thermal alteration, are predominantly of Florence A chert, while the brown clay unit artifacts evince no thermal alteration and are predominantly of Florence B chert. Rodents and roots would not be expected to exercise such selectivity in the transport of materials from upper to lower levels in the site.

Although TP 1 was excavated to depths of 90 to 100 cm., no cultural material was recovered beneath 70 cm. Thus, the lower cultural deposit detected in TP 1 is most likely no more than 30 cm. thick.

Since the testing of 14BU87 was compressed into the final week of the field season, there was insufficient time to permit the excavation of more than one test square. Efforts in the final days of the season were instead directed toward obtaining a better understanding of the site's complex natural stratigraphy. This was accomplished by excavating a backhoe trench across the northern most channel scar.

The 70 m. long trench was oriented due northeast along a vertex originating on the 500N baseline, 5 m. west of TP 1's southwest corner (Fig. 3.28). As a guide for the backhoe operator, and for reference in mapping the trench profile, stakes were placed at 5 m. intervals along the transect intended for the trench, which perpendicularly bisected the meander scar. After completion of the excavation, the east wall of the trench was mapped. At 5 m. intervals along the trench, 50 cm. wide sections of the wall were troweled. Stratigraphic units were described, and their thicknesses measured.

As shown in Figure 3.30, the first 15 to 20 m. of the profile exhibited essentially the same stratigraphy as revealed in TP 1. Near Profile 20, however, this sequence was truncated by a massive unit of dark brown silty clay, containing scattered charcoal flecks and alluvial gravel. Within this unit was a darker brown, clayier unit, which, although of the same shape as the surrounding unit, had a maximum thickness of about 1.8 m. Charcoal flecks were abundant in this unit.

These two units are interpreted as channel fill deposits, or accumulations of fine-grained sediments laid down following the channel's abandonment, as a result of settling of silts and clays suspended in floodwaters filling the old channel. As the channel gradually silted in, it became a more effective pond, holding water for longer periods of time, and thus accounting for the finer textures of the dark fill unit in the center of the old channel.

The channel fill units conform to the shape of the abandoned channel, and exhibit a steep side (demarcating the channel's cut bank) and a sloping side (which represents the laterally aggrading portion of the channel). The northern end of the backhoe trench provided excellent exposures of the abandoned channel's point bar sediments. As shown in Figure 3.30, the

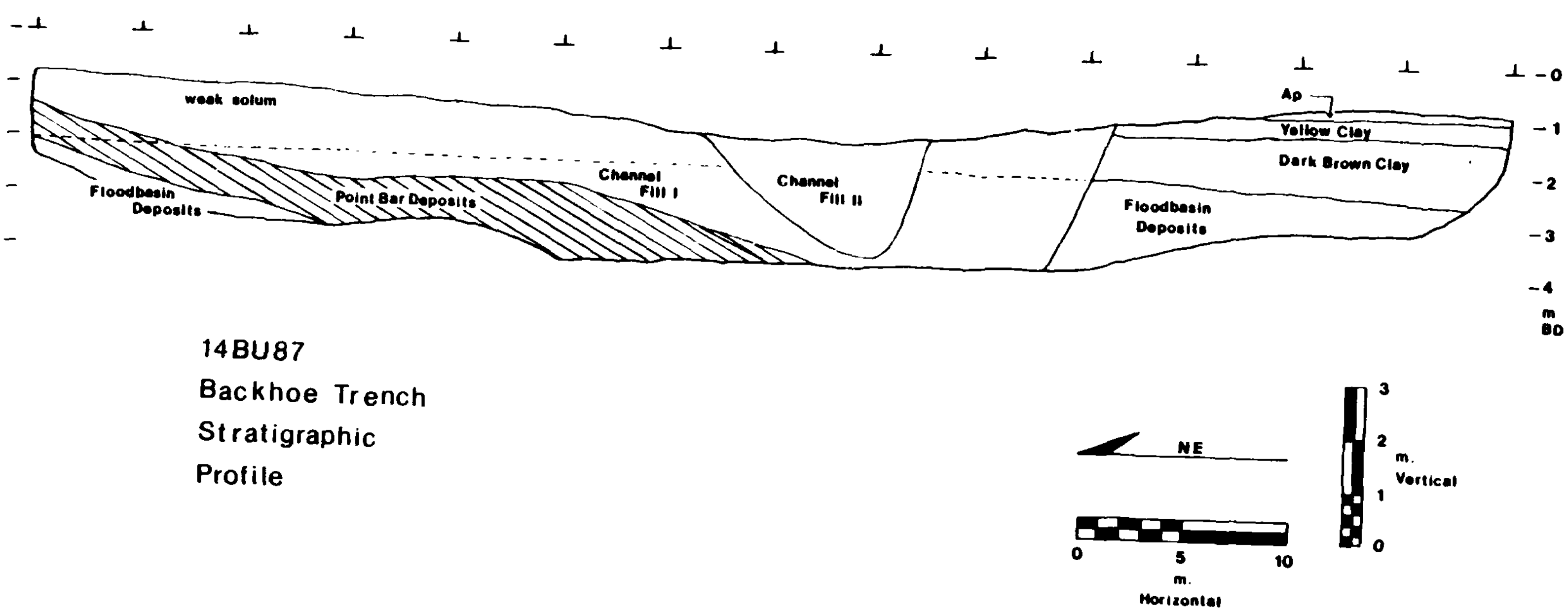

Figure 3.30. Backhoe trench profile, 14BU87.

channel fill units were deposited over a wedge-shaped unit of laminated silts and sands. Individual laminae, or sets of laminae, within this unit represent the deposits of successive floods, laid down while the channel was still active. Each set was deposited on the sloping surface of the set lying beneath it, and in this manner, the point bar gradually built itself southward.

The stratigraphy observed in TP 1 and the trench's southern end is not repeated in the exposures of the northern end, indicating that all exposures in this portion of the trench represent lateral accretion deposits of the abandoned channel's point bar.

Although considerable burning in the form of charcoal and burned earth lenses were recognized in the laminated units, no evidence of human occupation of the point bar was observed. Charcoal and burned earth lenses have been observed as natural features elsewhere in the project area (Leaf 1979:87), and are not unexpected, given the frequency of natural fires in midwestern environments (Swain 1973).

The lower component of 14BU87, detected in TP 1, is located in a stratum which, in the backhoe trench exposure, is truncated by the abandoned channel. This implies that the culture-bearing stratum was deposited before the channel developed, or, alternatively, that the lower occupation occurred while the channel was still active, and that cultural debris, deposited on the still active floodplain, was buried before the channel subsequently eroded it. The data presented above clearly show that the lower component could not have been occupied after the channel was formed, since the channel did cut into the deposit. The lower component, therefore, was occupied either prior to, or during the time that the channel scar was an active stream channel.

Relative Dating

Stratigraphy and projectile point morphology provide the basis for determining relative ages and cultural affiliations of 14BU87's two components. Although no diagnostic artifacts or dateable organics were recovered in situ from the site's buried deposit, a Late Archaic affiliation is suggested by stratigraphic correlation with other El Dorado Lake area sites. A yellow clay unit similar to that at 14BU87 is present on 14BU9, where it was termed "Zone C" and defined as 24-30 cm. thick, buried between 20 and 30 cm. below surface (Grosser 1970:10-11; see also Leaf, Chapter 4, this volume). Directly beneath this culturally sterile unit at 14BU9 lie buried Archaic occupational strata. The uppermost of these, termed the "Walnut phase" (Grosser 1970, 1973) probably correlates with the buried component on 14BU87. The Walnut phase at 14BU9 is associated with two radiocarbon dates of 1970 ± 110 B.P. (20 B.C.) and 2060 ± 80 B.P. (110 B.C.) (Leaf 1979:10). A corner notched projectile point from 14BU87 (Fig. 3.31f) is similar in size and shape to Walnut phase projectiles described by Grosser (1970, 1973). Its surface provenience, however, precludes its definitive association with the buried deposit, especially given the large overlap of Walnut phase with subsequent Woodland point

forms in the project area.

The stratigraphic position of 14BU87's upper component above the yellow clay unit is also comparable to 14BU9, where Woodland material occurs in a similar situation (Grosser 1970). Two contracting stemmed points (Fig. 3.31g,h), recovered from the site surface, are probably associated with this Woodland occupation. Although, in the El Dorado Lake area, few contracting stemmed points have been recovered from excavations, current evidence seems to suggest their affiliation with Woodland, as opposed to Archaic, occupations (Grosser 1973:232).

A Plains Village occupation was previously posited for 14BU87, based on the recovery, in 1977, of a small triangular projectile point (Root 1979:46-47). Subsequent investigation has recovered no further evidence of a Plains Village component. Although the intrasite provenience of the point is not known, it is conceivable that it was collected from some locus on the site other than the meander scar, where the two larger, stemmed points occurred. This might suggest that Plains Village and Woodland occupations are spatially discrete on the site. A second alternative is that the Plains Village point is an intrusive, isolated occurrence, whose presence at 14BU87 is largely coincidental. As a third alternative, it is possible that the triangular point was produced by a Woodland group. The occurrence of small triangular points in dated Woodland contexts is documented in northeast Oklahoma by Henry (1978), while the co-occurrence of small "arrow" points with larger "dart" point forms is known from Woodland context in the project area at 14BU19 (Fulmer 1976).

Artifact Analysis

The present analysis considers only those materials recovered from the 1978 investigations at 14BU87. Although surface collections were made on the site in 1977, an unknown proportion of these materials are of questionable provenience. As noted by Root (1979:46-47), 14BU87 is located immediately north of, and in the same cultivated field as, 14BU88. Both sites were recorded on the same day by the same survey team, but the exact boundary between them was not determined until after the initial surface collections had been made. Given the incomplete understanding of site boundaries at the time of collection, the 1977 samples are disregarded in the following analysis.

The 1978 surface collection focused on the southern half of the site, and thus the artifacts discussed here were recovered from the 1.8 ha. surface scatter defined in Figure 3.28. The assemblage probably represents a mixture of materials from the upper and lower components on the site. Given relatively high artifact densities on the southern slope of the meander scar, materials may be eroding from buried deposits exposed along the slope. In addition, materials are probably washed into the meander from higher surfaces.

A diversity of raw material categories are present in the 14BU87 surface assemblage, including quartzite, weathered chert, limestone, bone and chipped stone.

Seven specimens of limestone were recovered. Two of these exhibit pinkish discoloration generally attributed to thermal alteration, suggesting their use as hearthstones.

Two of the eight weathered chert specimens exhibit reddish discoloration, suggestive of thermal alteration, possibly resulting from use as hearthstones. One small cobble of weathered chert (61 mm. in diameter) shows evidence of battering along one margin, suggesting its use as a percussor, possibly in lithic reduction. Another, much larger cobble (maximum dimension 128 mm.) exhibits a roughening, which if due to utilization, represents the use of the artifact in a grinding or rubbing task. Two specimens exhibit plane surfaces, suggesting their utility as manos or metates in grinding or pulverizing tasks. Two specimens have the form of truncated ellipsoids, one of which possesses a pit on the truncation surface, suggesting its use as a nutting stone. The other possesses a plane truncation surface and may have been useful in grinding or pulverizing tasks.

Three cobbles of quartzite were recovered from the site. Two of these were probably used as hammerstones in lithic reduction activities, since evidence for their utilization is restricted to small surfaces on the ends of cobbles. The third quartzite artifact is 127 mm. long. Roughly triangular in cross section, it has a thickness orthogonal to its length of 60 mm. Two of the three long edges are heavily worn, as are both ends of the artifact. Although the wear on the long edges suggests that the tool was used in a grinding task requiring lateral motion, the wear on the ends suggests a pulverizing or crushing function.

Two fragments of bone, recovered from the surface of 14BU87, represent a lower molar and skull fragment of a bovid. Both are extremely weathered and could represent either *Bison* or *Bos*. Their association with the prehistoric occupation of 14BU87 cannot be demonstrated.

During surface reconnaissance of 14BU87, a large number of alluvial cobbles and gravel were noted on the site's surface. The site's proximity to both permanent and intermittent streams strongly suggests that much of the alluvial gravel was transported to the site naturally. However, at least 24 alluvial cobbles were classified as tested raw material, since they exhibited fracture surfaces which could be attributed to prehistoric artisans. This indicates that the procurement of raw materials from nearby gravel deposits was an important site activity.

Although Florence A chert is a significant component of the products of initial reduction at 14BU87, its source was probably not the nearby secondary alluvial deposits. Only three of the 22 tested cobbles are identified as Florence A chert, while, of the 33 Florence A cortical flakes and chunks, only one flake exhibits hydration patina. The high incidence of limestone matrix cortex indicates that Florence A chert was obtained from primary, rather than secondary, deposits. Such deposits have been reported from the vicinity of Satchel Creek, a few kilometers south of 14BU87 (Matthew Root, Museum of Anthropology, personal communication).

As shown in Table 3.36, thermal alteration is more frequent among Florence A than Florence B cortical elements. While 58% (19 of 33) of the

Table 3.36. Data on chipped stone chert types and thermal alteration, 14BU87 surface.

	Florence A		Florence B		Light Gray		Ind./Misc.		TOTAL	
Technoclass	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
Tested Cobbles	-	3	5	13	-	-	-	1	5	17
total:	3		18		-		1		22	
Core	1	2	-	6	-	2	-	-	1	10
total:	3		6		2		-		11	
Cortical Chunk	8	3	1	5	-	1	-	7	9	16
total:	11		6		1		7		25	
Decor. Flake	11	11	3	14	-	-	3	12	17	37
total:	22		17		-		15		54	
Int. Flake	27	40	6	48	-	7	2	8	35	103
total:	67		54		7		10		138	
Bif. Trim. Flake	1	2	-	4	-	-	-	2	1	8
total:	3		4		-		2		9	
Shaped Tool	4	1	1	7	-	-	-	-	5	8
total:	5		8		-		-		13	
TOTAL	52	62	16	97	-	10	5	30	73	199
total:	114		113		10		35		272	

Florence A cortical elements exhibit thermal alteration, the incidence of this characteristic among Florence B cortical elements is only 17% (4 of 23 elements). With regard to thermal alteration, the two chert types were evidently treated differently in the early stages of reduction. It is possible that thermal alteration was required, in the case of Florence A chert, to facilitate removal of the limestone matrix. Alternatively, it is conceivable that fire was employed in the extraction of Florence A chert from primary deposits. These two possibilities require further evaluation.

Cores from 14BU87 provide further evidence of the differential handling of the two Florence chert types. Although 6 of the 11 cores are of Florence B chert, none of these were shaped for the systematic removal of flakes. Rather, the inconsistent orientation of flake scars and platforms on the cores (all of which represent alluvial cobbles) suggests that their utilization was largely opportunistic. A similar interpretation is suggested for the two Flint Hills Light Gray cores, both of which represent alluvial cobbles.

By contrast, two of the three Florence A cores evince systematic shaping. One is discoidal in form, while the other (Fig. 3.31a,b) has a single platform from which all flake scars originate. The third core is polymorphic, possessing no consistent orientation of flake scars. All three Florence A cores are small, relative to the sizes of many cortical and non-cortical elements in the assemblage. This suggests that they were discarded only after being extensively worked.

Florence A and Florence B cherts comprise 49% and 39%, respectively, of the intermediate flakes from 14BU87. As was the case for cortical elements, the incidence of thermal alteration is greater among Florence A chert (40% of which evinces heat treatment) than among Florence B (11% of which is heat treated). Thermal alteration of Florence A chert is less frequent for non-cortical elements than for cortical elements (58% compared to 40%, respectively). One possible explanation of this decrease is presented here. If, as suggested above, heat was applied to unmodified chert nodules, to facilitate either extraction or cortex removal, then it might be expected that thermal discoloration would not extend throughout the nodule, but would be only marginal. Thus, decortication flakes struck from the nodule's exterior, would exhibit greater frequencies of heat discoloration than intermediate flakes, derived from increasingly deeper portions of the nodules.

Four bifacial trimming flakes of Florence B chert were recovered, compared to three of Florence A. Thermal alteration is evinced by only one Florence A trimming flake. The remaining Florence A flakes and all four Florence B flakes are unheated.

The 13 shaped tools from 14BU87 are grouped into projectile point, hafted biface, bifacial preform, partially shaped biface, and miscellaneous biface fragment categories. As shown in Table 3.37, five specimens of

Table 3.37. Chert types and thermal alteration of shaped tools, 14BU87.

Category	Florence A Heat	Florence A No Heat	Florence A Total	Florence B Heat	Florence B No Heat	Florence B Total	TOTAL
Projectile Point	1	-	1	1	1	2	3
Hafted Biface	-	1	1	-	-	-	1
Bifacial Preform	3	-	3	-	2	2	5
Partially Shaped Biface	-	-	-	-	3	3	3
Miscellaneous Fragment	-	-	-	-	1	1	1
TOTALS	4	1	5	1	7	8	13

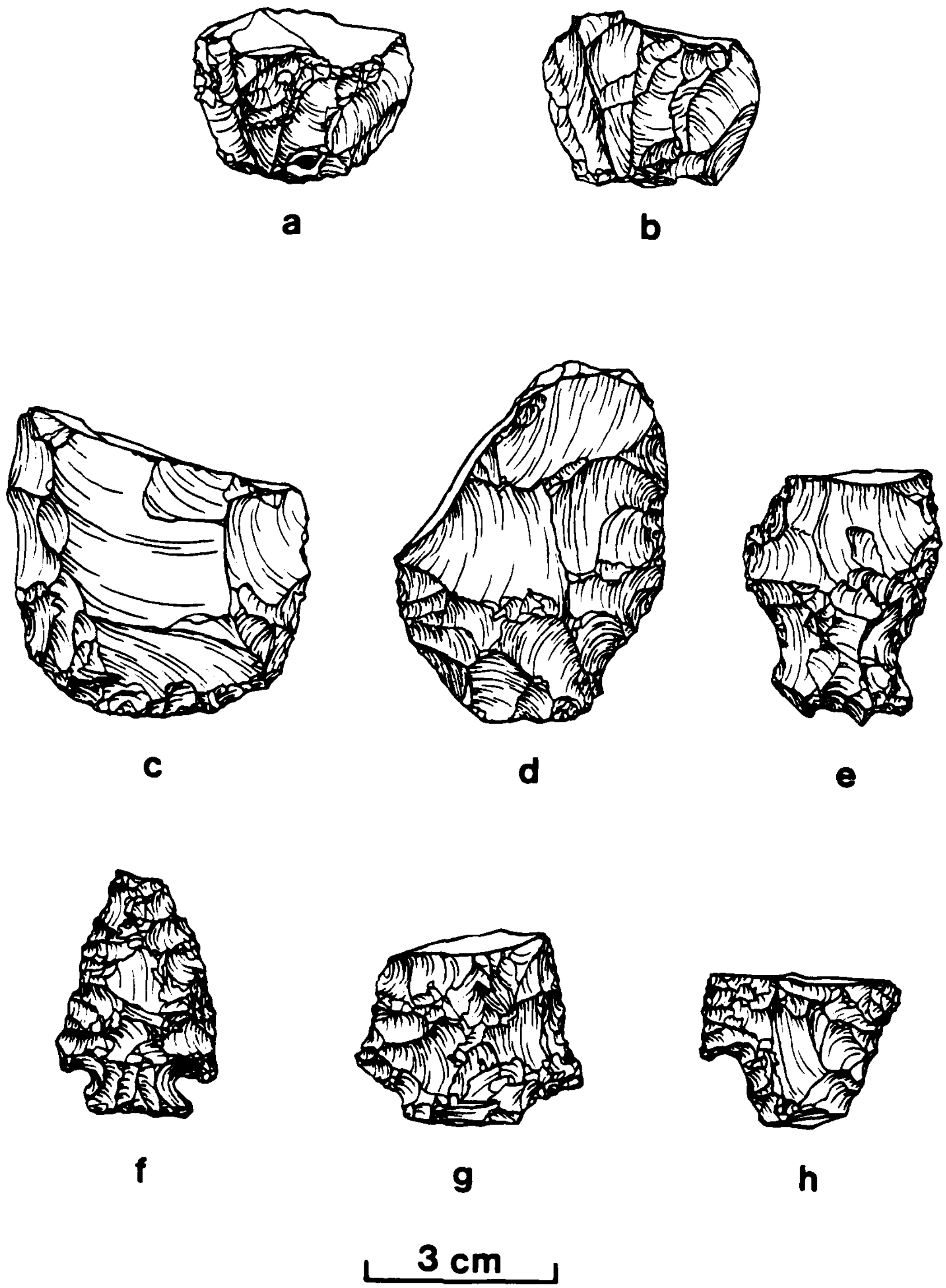

Figure 3.31. Shaped tools and a core from 14BU87: (a,b) lateral and partial oblique view of core nucleus; (c) partially shaped biface; (d) bifacial preform exhibiting crenated fracture; (e) hafted biface; (f) corner-notched projectile point; (g,h) contracting stem projectile points.

Florence A and eight specimens of Florence B chert are present. Thermal alteration is evident on four of the five Florence A tools, while no Florence B specimens evince heat treatment. Flint Hills light gray is not represented among shaped tools.

The three partially shaped bifaces (all of unheated Florence B chert) exhibit plano-convex to rhomboid cross sections. Remnant cortex is present on two specimens, one in the form of hydration patina, the other in the form of a limestone matrix. Although the third artifact does not exhibit cortex, a relatively unflaked surface is present, as shown in Figure 3.31c. The obverse surfaces of two of the bifaces exhibit invasive flake scars, while the third possesses an unflaked obverse surface. The transverse fracture surfaces of these artifacts suggest their breakage is attributable to mechanical failure such as end shock or lateral snap. Only one specimen (Fig. 3.31c) shows signs of utilization, in the form of step faceting and crushing on the terminal margin.

These bifaces indicate that the preliminary stages of biface manufacture from Florence B chert was initiated at the site. The miscellaneous biface fragment is most likely a marginal fragment of a partially shaped biface, since it possesses a small area of remnant patina.

Bifacial preforms from 14BU87 represent a second stage in the manufacture of bifaces at the site. Two of these are of unheated Florence chert, while three are of thermally altered Florence A (Fig. 3.31d). Although no partially shaped bifaces of Florence A chert were recovered in the 1978 surface collections, this may be a sampling bias. The 1977 collections contain several partially bifaced fragments of cortical Florence A chert. While, as discussed previously, these artifacts may not with certainty be assigned to 14BU87, it is probable that revisits would produce others like them, thus filling in a gap in the reduction sequence posited here.

In terms of thickness and cross-sectional shape, the three projectile points (Fig. 3.31f-h) and the hafted biface (Fig. 3.31e) are not distinguishable from the preforms discussed above. The hafted biface, of unheated Florence A chert, was fashioned from relatively unaltered lithic material, since one surface possesses a thin hydration patina. The artifact most likely represents a bifacial knife.

The corner notched projectile point (Fig. 3.31f), of thermally altered Florence A chert, is fashioned from a triangular, straight-based preform. The distal end exhibits an impact fracture, suggesting its breakage during utilization.

Two medial fragments of contracting-stem points are represented, both of Florence B chert, one of which (Fig. 3.31h) is thermally altered. The transverse fractures on the stems of both artifacts are identical in form, and suggest that breakage occurred during utilization. The force which caused the transverse fracture was directed from a surface, rather than a margin, of the tool, since the break "hinges over" the opposite surface, creating a step fracture on that surface. This form of breakage is similar to that associated with impact fractures, and may result from the lateral

twisting of the projectile in its haft. Transverse fractures of the blade elements of the two points were mechanically induced, but whether the breaks resulted from utilization or subsequent attempts to rework the tool is undetermined.

Table 3.38 summarizes the types of breakage observed on shaped tools from 14BU87. The low frequency of thermoclastic breakage indicates that heat treatment was not a common element of tool manufacture at the site. Evidence of thermal alteration is restricted only to the latter stage of tool finishing as presented by preforms (Fig. 3.31d) and finished projectile points (Fig. 3.31f) which suggests that heat treatment was not required in earlier stages. The restriction of thermal alteration (with a single exception) to Florence A tools suggests that heat treatment was selectively applied to only certain kinds of chert.

The above analysis suggests that technological activities at 14BU87 embraced all stages in a lithic reduction model, beginning with the procurement of raw materials, and ending with biface manufacture. Within this sequence, specific lithic materials were handled in different ways, expecially with regard to thermal alteration. It is posited that thermal alteration was accomplished during initial reduction (and/or procurement) of Florence A chert, as well as during the final shaping of bifacial tools.

In evaluating the reduction sequence posited here, it should be noted that the 14BU87 surface collection is here treated as a single assemblage, even though stratigraphic evidence of two temporally discrete occupations is present. However, evidence present in the small excavated assemblages is not inconsistent with the patterns observed in the surface collections. Table 3.39 shows that, in samples obtained from TP 1, both components yielded evidence of all stages of lithic reduction, from initial decortication to bifacial trimming. In addition, the excavated assemblage, like

Table 3.38. Breakage types observed on shaped tools from 14BU87.

Category	Impact	Impact and Mechanical	Mechanical	Thermal	Indeterminate
Projectile Point	1	2	-	-	-
Hafted Biface	-	-	1	-	-
Bifacial Preform	-	-	2	2	1
Partially Shaped Biface	-	-	3	-	-
Miscellaneous Fragment	-	-	1	-	-
TOTALS	1	2	7	2	1

Table 3.29. Chipped stone technoclasses represented in excavated assemblage, TP 1, 14BU87.

Excavated Level	Decor. Flake	Int. Flake	Noncor. Chunk	Bif. Trim.	Total
Upper Component:					
00-10 cm. BS	5	31	1	-	37
10-20	-	1	-	1	2
Total:	5	32	1	1	39
20-30 cm. BS	-	-	-	-	-
Lower Component:					
30-40 cm. BS	1	1	-	-	2
40-50	-	3	-	1	4
50-60	-	2	-	-	2
60-70	1	3	-	-	4
Total:	2	9	-	1	12

the surface assemblage, shows a higher incidence of thermal alteration of Florence A, relative to Florence B, chert (Table 3.35). Based on these data, it is conceivable that broadly similar lithic technologies were operative at the site during both the Woodland and Late Archaic occupations, although a larger sample of material would be required to fully validate this hypothesis.

In addition to lithic reduction, other activities accomplished at the site are suggested by the presence of certain tool classes. Projectile points, at least one of which exhibits impact fracture, suggests that hunting activities involved use of the site. Weathered chert and quartzite artifacts showing evidence of use as grinding stones suggest that plant food processing was accomplished at the site.

Retouch was recognized on 45 flakes, 26 of which possessed functional edges suitable for cutting. This may indicate that butchering tasks were accomplished at the site, an inference possibly supported by the presence of a hafted biface. Whether projectile points, bifacial preforms, or other lithic artifacts were utilized for such purposes is not known.

Eight retouched flakes (including two flakes also possessing cutting edges) exhibit steeply angled scraping edges, suggesting utility in hide-working or woodworking activities. Eleven flakes possess notched or denticulate edges, possibly indicative of woodworking tasks, while one flake is retouched to form a perforator/graver, indicative of bone or hideworking. The final retouched flake exhibits a thick cross section and a blunt, biclinal edge which would possibly have utility in heavy cutting or butchering tasks. A similar function is posited for a partially shaped biface, which evinces heavy utilization along its distal margin.

The assessment of site activities provided above indicates a broad range of activities performed at the site. The relatively low artifact densities and the absence of evidence of midden accumulation, however, do not indicate that the site was intensively used as a base camp or village. It is possible that the diversity of posited activities refers to the repeated, but short-term use of the site over long periods of time.

Summary and Recommendations

Two vertically stratified archeological deposits are present on 14BU87. The uppermost is a surficial Woodland occupation, with a possible mixture of Plains Village materials. The lowermost occupation is poorly known, but potentially significant, since stratigraphic correlation with 14BU9 suggests the possibility of an Archaic affiliation.

In addition to the site's archeological significance, its importance in geomorphological studies should also be emphasized. Based on the preliminary stratigraphic considerations presented above, the channel scar observed on 14BU87 represents an abandoned course of Durechen Creek which was active either during or after the site's lowermost occupational episode. A precise determination of the age of either the cultural deposit or the channel would contribute to the understanding of fluvial processes, prehistoric behavior, and their interrelationship.

El Dorado Lake at conservation pool stage (1339 ft. above mean sea level) will only partially inundate 14BU87. As shown in Figure 3.27, the 1339 ft. contour isolates two small areas of the southern half of the site, while most of the site's northern half will be preserved. Shoreline erosion will contribute to the destruction of portions of the northern half, while extensive destruction of the site's southern half is to be anticipated. As destruction proceeds, cultural material will be exposed, and thus, management considerations should include plans for the monitoring of this process by archeologists.

The site will be subject to complete inundation periodically, since the entire site lies below El Dorado Lake's 1347.5 ft. flood pool elevation. Although infrequent, inundation will result in further destruction of the site.

In addition to the monitoring of shoreline erosion processes, it is recommended that further mitigation, in the form of more extensive testing,

be undertaken in an attempt to gather a more complete understanding of the site's buried component. Placement of additional test squares on the site would attempt to determine the areal extent of the deposit, and hopefully would encounter denser concentrations of debris, including dateable organics and diagnostic artifacts. These excavations would also contribute to a more detailed understanding of site stratigraphy, and could be designed to focus on the chronological relationship of the lower cultural occupation and the abandoned stream channel. Since the investigations reported here suggest that the site's upper component is completely contained within the upper 10-20 cm. of the site, further excavation of it is not recommended.

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CHAPTER 4

WOODLAND OCCUPATION OF THE SNYDER SITE, (14BU9)

Gary R. Leaf

Abstract

Phase II work at the Snyder site attempted to detect and investigate an undistrubed portion of the Woodland occupation zone in order to retrieve information on the probable former existence of houses as well as site activity structure and settlement type. A block excavation demonstrated that even though most of the Woodland deposit had been disturbed by cultivation there are intact remnants of occupation zones which occur as thin lenticular lenses; investigation of part of one such lense yielded 11,570 artifacts, eight postmolds and two artifact concentrations. A circular stain with three postmolds on its perimeter allowed formulation of the hypothesis that Woodland people had scooped out a roughly circular, basin-shaped pit and then built a house over the pit by driving and/or setting posts around its perimeter. The hypothesis was tested by expanding the excavation and by analysis of artifact spatial distributions. Even though the proposition was rejected, i.e., a Woodland house was not detected in the excavation, a large daub sample demonstrates that prehistoric structures of some kind were built on the site. The two artifact concentrations resulted from prehistoric trash dumping. The Snyder site may have been the location of a small hamlet during Late Woodland occupation of the upper Walnut River Valley.

Introduction

The Snyder site (14BU9) has been the most extensively excavated and intensively studied archeological resource throughout the history of the El Dorado Lake project. First surveyed and recorded in 1967 (Eoff and Johnson 1968), the site's theoretical and substantive potential were recognized upon completion of test excavations in 1968 (Bastian 1969). Subsequently, larger excavations were placed on the site during the 1969 through 1971 field seasons. Results from these excavations and various analytical studies are discussed at length by Grosser (1970, 1977), Grosser and Klepinger (1970), and Klepinger (1972); and are summarized by Grosser (1973). Succinctly stated, this earlier work demonstrated the existence of a Woodland component and more than three Archaic components; these temporally discontinuous occupations span a period of more than 3000 years. A brief summary of findings is set out below as the four phase cultural sequence posited for Snyder by Grosser (1970, 1973, 1977).

The Butler phase Woodland component (estimated at A.D. 200 to 800) was found on the site's surface and in the plowzone. Man-made features, such as storage pits, extended through the plowzone into a culturally sterile yellowish-brown clay. Ceramics were, predominantly, a calcite tempered

ware with cord marked exterior; a less frequent group was tempered with fired clay and had zoned dentate stamping on rim exteriors. This latter numerically small pottery group exhibited designs which compare favorably with motifs frequently observed on Hopewell ceramics. The lithic assemblage contained scrapers, celts, bifaces, retouched and utilized flakes, and two broad classes of projectile points. One class was composed of a variety of small, notched, triangular forms suitable for use with the bow and arrow; the second class contained larger forms, notched or stemmed, that were either hafted knives or atlatl dart points. This lithic assemblage, as a whole, was interpreted as a set of hunting and butchering tools which were used to process the deer and bison remains associated with them. Recovery of grinding stones suggested that floral food resources were also exploited. The Butler phase component was thought to represent something more substantial than a temporary camp, possibly a village.

The Late Archaic Walnut phase component (estimated at 900 B.C. to A.D. 1) was stratigraphically separated from the overlying Woodland component by a 25-30 cm. thick yellow-brown clay layer. This particular Late Archaic occupation is known only from a small number of chipped stone tools which were scattered throughout a soil zone 40 cm. thick. Ceramics were not recovered in this component. Projectile points include a variety of small, triangular, corner-notched forms usable with bow and arrow; a less frequent variety of larger corner-notched and stemmed forms were construed as atlatl dart points. Butchered remains of deer and bison were recovered, but no charred plant foods were found. The fauna, lithic assemblage, and four excavated hearths suggested that the Walnut phase component was a temporary hunting camp where game was processed and chipped stone tools were manufactured.

Ten centimeters of artifactually sterile soil separated the Walnut phase occupation from the underlying El Dorado phase component (estimated temporal span 1900 to 1100 B.C.). Stemmed lanceolate projectile points, probably used as atlatl dart tips, were markedly different from Walnut phase point forms. Chipped stone knives, scrapers, drills, choppers, and axes were cited as evidence for hunting, butchering, hideworking, and woodworking. Hammerstones and chipping debris attested to tool manufacture and maintenance activities. The large number of grinding stones and the presence of hackberry, pigweed, and chenopod seeds indicated an extensive use of plant foods. Animals which were hunted or collected include deer, bison, rabbit, antelope, beaver, badger, raccoon, muskrat, otter, ferret, coyote, prairie dog, fish, box turtle, bird, and river mussel. Excavated features were diagnosed as hearths, postmolds, storage pits, and a human burial. Large dark stains, associated with concentrations of burned earth, daub, limestone, and mud dauber nests, were construed as the remains of houses. The El Dorado phase component was interpreted as a base camp or village.

The Chelsea phase component (estimated at 2700 to 2000 B.C.) was stratigraphically continuous with lower portions of the El Dorado phase deposits, yet separable on the basis of very different projectile point shapes. The points were short, broad bladed, had a marked shoulder and an expanded base. The lithic assemblage also contained knives, choppers, and a drill. Chipped stone tools were associated with the remains of deer, bison, antelope, rabbit, raccoon, and box turtle. Grinding stones were recovered as well as

charred walnut and chenopod remains. The various tools, flora, and fauna indicated hunting and gathering subsistence activities. These data, in conjunction with the excavated hearths, postmolds, and storage pits, suggested that the Chelsea phase component was a base camp.

A deep trench cut through portions of Snyder with a backhoe in 1970 uncovered a concentration of burned limestone at a depth of 250 cm. below ground surface. Even though no diagnostic artifacts were found with the limestone, the trench demonstrated that there is 100 cm. of culturally sterile soil separating the Chelsea phase occupation from the more deeply buried limestone feature. Thus, there is at least one prehistoric occupation, and possibly others, buried below the Chelsea deposits.

The Problems

Previous excavations at 14BU9 were focused on the largely unknown Archaic occupational sequence. The most extensive earlier work had determined that post-Archaic occupational residues were confined primarily to the surface and plowzone. A thin sub-plowzone artifact-bearing soil had been detected during one field season, but could not be found or confirmed during three subsequent seasons. Also, on the basis of variable projectile point morphologies, it was posited that culturally and chronologically distinct post-Archaic occupations may have been mixed together on the surface. The major conclusions derived from these investigations were: (1) that the Woodland component had been largely destroyed by cultivation; and (2) that only man-made features could be found intact below the plowzone (Grosser 1970, 1973). However, even earlier work on the site offers an intriguing and partially contradictory finding. Extensive tests conducted in 1968 found two culture-bearing soil zones separated by a sterile zone. The upper zone was identified as Woodland and was characterized as containing certain kinds of stone tools, pottery, and <u>structures</u> as indicated by postmolds (Bastian 1969).

Since earlier studies arrived at opposite conclusions with regard to the intactness of a Woodland occupation zone, and since intact Woodland deposits in the project area seem to be few in number, the new excavation attempted to locate and investigate an undisturbed portion of the Butler phase Woodland component. Related problems of interest included the possibility of discovering more than one Woodland occupation (recall the potsherds mentioned above with Hopewellian designs), total surface area covered by Woodland debris, and subareas of differential surface density and/or function. If an intact occupation zone could be found, the excavation was designed to determine the probable former existence of houses and retrieve data on activities, activity structure, and settlement type. A special effort was made to collect charcoal for radiocarbon dates and to retrieve floral and faunal remains. One additional problem that had to be addressed was the possibility that post-Woodland occupational debris had been mixed by cultivation with Woodland materials. If true, analyses and conclusions based on surface collected samples would become epistemically weak and confidence in knowledge about the Woodland occuaption, per se, would decrease. It was, therefore, important to resolve the problem of whether or not there had been prehistoric occupancy of the site after it was abandoned by Woodland groups. These site specific problems, along with the project-wide problem set which focuses on prehistoric subsistence and settlement systems

(Leaf 1979), guided the implementation of a block excavation which could be used to sample the underlying Archaic deposits as well.

Site Description

The Snyder site is located near meanders on the west (right) side of the Walnut River approximately 1.6 km. upstream from the mouth of Satchel Creek (Fig. 4.1). There are several other sites in the immediate area; 14BU4, 14BU90, and 14BU83 are on the other side of the Walnut River east of 14BU9, and, on the same side of the river are 14BU30 to the south and 14BU51 to the north. El Dorado Lake's multipurpose pool will cover all six sites. Although previous investigators prepared contour maps of Snyder, they left no monuments on the site and no detailed records which could be used to precisely determine the loci of test pits, excavations, and grid systems. A new map was prepared and monument hubs were placed for future reference. The map (Fig. 4.2), offered here without the numerous contour lines, illustrates the site's significant topographic features. A small but permanent stream, which heads at a spring 1.2 km. northwest, currently flows through the site. Site boundaries between the spring-fed stream and the Walnut River are based on surface collection sweeps. The field in which this eastern part of 14BU9 lies was planted in oats (1978) and wheat (1979) both of which were harvested in late summer. A combination of poor surface visibility, low artifact density, and large site area, precluded an efficient or productive grid controlled surface collection. Illustrated limits of debris distribution and concentrations are based on several sweeps conducted when surface visibility improved after cultivation and thundershowers. Site boundaries drawn for the area between the stream and railroad tracks (subarea D) are guesswork. Subarea D is in pasture, but a 2 by 2 m. square test excavation demonstrated the presence of prehistoric artifacts. Thus, Snyder extends west of the small stream, but it is not known, with any accuracy, how far or how much additional area is included. If the eastern area only is considered, surface debris extends 488 m. north to south, 183 m. east to west, and covers 6.8 ha. of land. Even though these dimensions were measured, they are too small; the surface area and east-west measurements, in particular, do not include subarea D or those parts of 14BU9 washed away by the Walnut River.

The eastern portion of Snyder lies in what can be described as the Walnut River Valley's second bottoms. Due east of site reference (Fig. 4.2), a distinct step down of about 1.5 m. occurs at the treeline. This lower land surface, currently covered with timber and secondary growth, may be the Walnut's present floodplain. The river is 21 m. further east and flows 4.8 m. below floodplain surface. The step which joins the floodplain with the upper surface may be a terrace edge, but geomorphological work has not yet solved this problem, nor have investigations been focused on the depositional history of the second bottoms. It should be pointed out that the Walnut is actively cutting into the second bottoms formation, and the cultural deposits it contains, in the extreme northeastern site area (Fig. 4.2). The 1857 GLO survey plats show the Walnut's channel further east than at present, so the river has moved west since then and has cut into the site. Woodland artifacts occur on the surface, or very near the surface, of the second bottom; the Archaic components are buried within it.

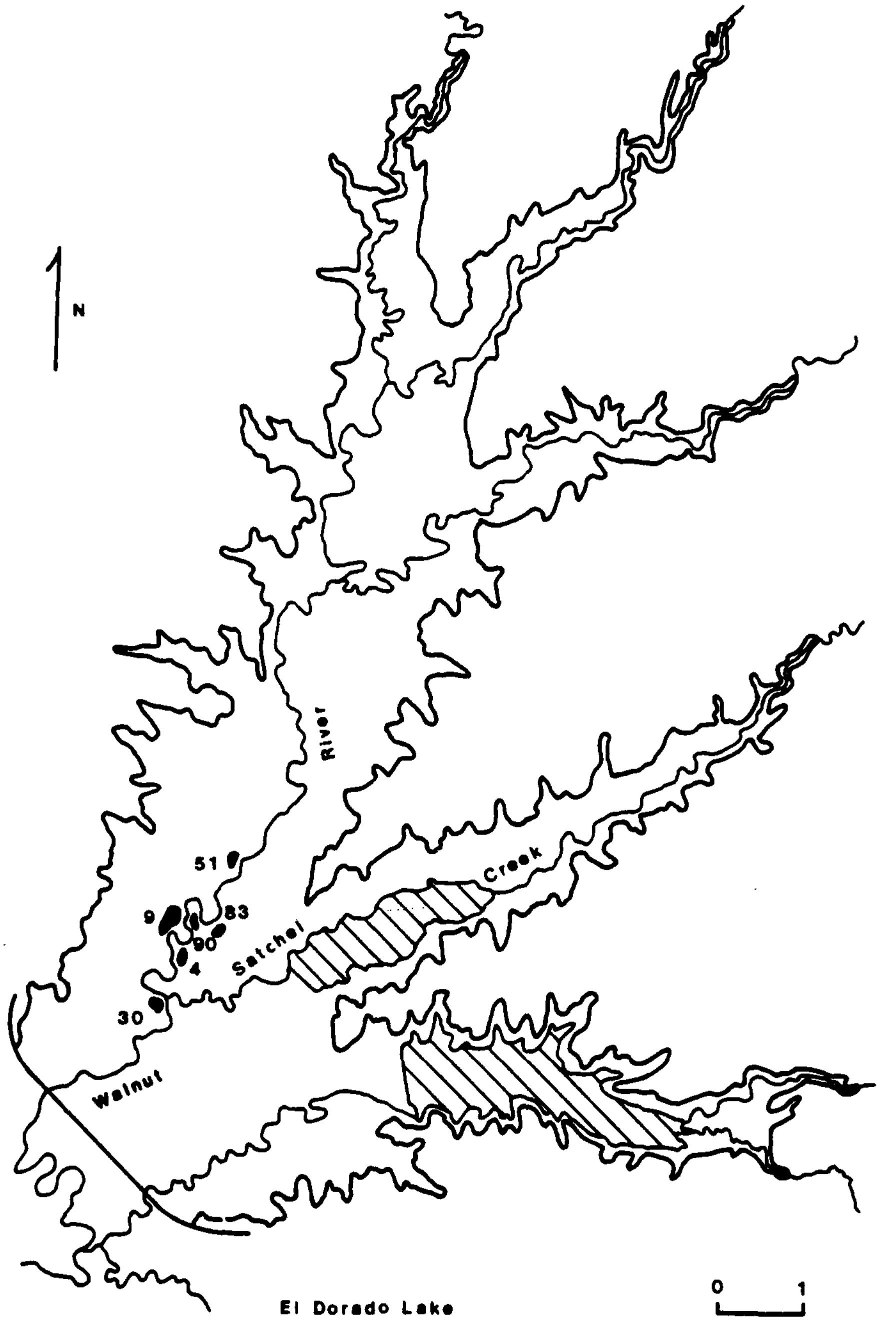

Figure 4.1. El Dorado Lake at full flood pool showing the location of 14BU9 and neighboring sites.

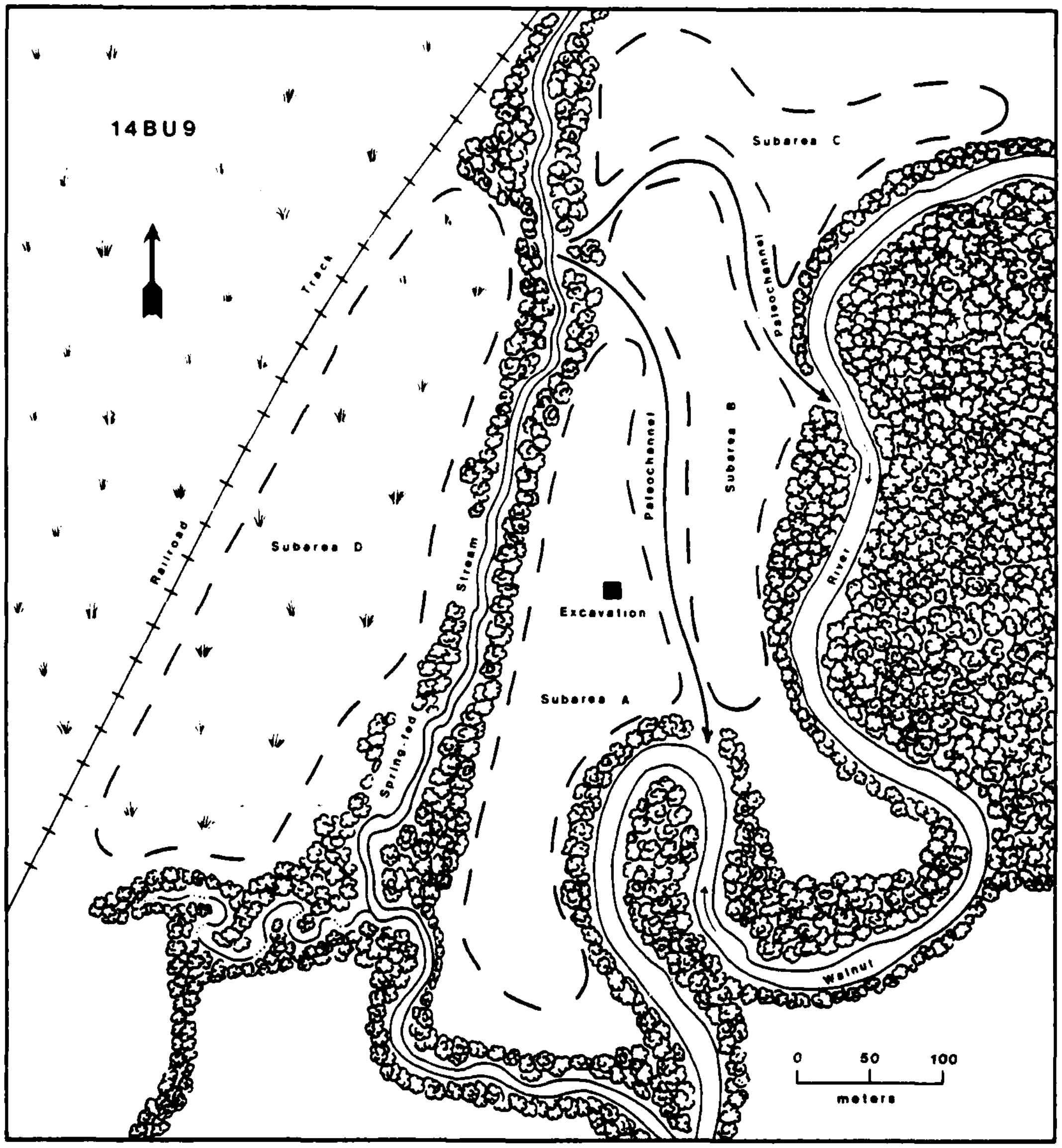

Figure 4.2. Map of Snyder site illustrating location of significant topographic features, surface debris concentrations and excavation.

Details of relief and differential surface debris concentration in the eastern portion of Snyder may be related to the past behavior of the spring-fed stream. Surface collection sweeps over the site detected three internal areas of high concentration and a probable subarea of chronologically separable artifacts (Fig. 4.2). The three large areas of greater surface concentration (subareas A,B,C) are separated by linear depressions. These depressions are former channels of the spring-fed stream; they show up very well on a 1973 aerial photograph (Fig. 4.3) as light lines in the darker vegetation. Furthermore, the 1857 GLO survey plats clearly show the small stream flowing in the southernmost abandoned channel. This old stream bed is, therefore, not a paleochannel of the Walnut River as proposed by Grosser (1970, 1973, 1977).

Figure 4.3. Aerial photograph of Snyder site and vicinity (U.S.C.E., 19-13, 4-20-73).

When the stream flowed through its southern paleochannel, it washed away portions of the buried Archaic deposits. A backhoe trench excavated through the paleochannel in 1978 showed that Archaic components are buried below it. And, in addition, diagnostic Archaic artifacts have been surface collected from the old channel's western slope. It follows that the spring-fed stream flowed through its southernmost paleochannel after the Archaic components had been laid down.

There is less evidence relating Woodland deposits to the past behavior of the small stream. Since there are few surface artifacts within either paleochannel, but large concentrations of Woodland debris surrounding the old channels, there are two alternative hypotheses: (1) the Woodland materials were deposited and then eroded away by the stream ; or (2) Woodland groups were in residence at Snyder when the spring-fed stream flowed in its abandoned channels. The first hypothesis appears to be the more likely of the two because in 1857 the stream was seen flowing through one abandoned channel and there is very little Woodland debris in either depression. Also, since the surface between the two paleochannels (subarea B) is slightly lower in average elevation than the large surface between the stream's present channel and its southernmost paleochannel (subarea A), it appears that the spring-fed stream meandered between the two paleochannels and possibly disturbed all of the post-Archaic deposits in subarea B. The average surface elevation of subarea C is also lower than that in subarea A, so it too may have been reworked by the small stream. Subarea A may, therefore, be the only area in Snyder's eastern portion that has not been distrubed by the spring-fed stream. Present evidence, then, suggests that Archaic and Woodland groups occupied the site, deposited their respective components, and then the stream cut at least three channels through the cultural deposits, two of which have been abandoned. It is, of course, necessary to test these hypotheses and tentative interpretations with geomorphological field research.

High surface debris concentration in the three large areas (subareas A, B,C) is also related to cultivation and soil erosion. The combined effect of cultivation and erosion has been to remove loose topsoil, lower present ground surface, and concentrate cultural debris near the surface. Since the surface areas around the spring-fed stream's present and former channels are higher than those channels, loose topsoil is washed away by surface runoff flowing to the Walnut River in the paleochannels. Artifact concentrations in subareas A, B, and C were, therefore, enhanced by past stream behavior and topsoil erosion; their discreteness cannot be accounted for, at present, by prehistoric human behavior. The chronologically separable artifacts may be so accountable. Most of the potsherds exhibiting Hopewellian design features, zoned check-stamping, were surface collected in the east-central part of subarea A (Fig. 4.2). There are no readily apparent natural processes that can account for their distribution. The absence of ceramics with Hopewellian designs throughout the rest of Snyder, and the presence of later Woodland projectile point styles in subareas A, B, and C, suggest that there are temporally distinct Woodland occupations on the site. The possibility of also detecting functionally different occupations by analyzing the separately collected surface samples from subareas A, B, and C was attempted, but without success. The Snyder site has long been a favorite relic hunting area for amateur collectors; their activities, in conjunction with cultivation

and erosion, have made it impossible to posit internal Woodland site structure from analysis of surface collected artifact samples.

Block Excavation: Stratigraphy and Features

A one meter grid system was established for 14BU9. The site's reference point, set up in subarea A, was arbitrarily assigned coordinates 500N500W to insure that all grid units on the site were situated in the northwest quadrant. Monuments were placed in treelines at the extremities of the south and east-west baselines. All previous tests and excavations had been conducted in subarea A, described above as that part of Snyder exhibiting the greatest debris concentration and the highest average surface elevation. Given the substantial successes of earlier work, the dubious status of other subareas, and the problems guiding the 1978 (and subsequent) investigations, the best place to set out a new excavation was, obviously, somewhere in subarea A. A 10 by 10 m. square block was, therefore, laid out where it would not intersect previous excavations, where a high surface debris concentration was known to exist, and where no evidence for paleochannels could be found. Specifically, the 100 sq. m. area is contained within the coordinates 480N490W, 490N490W, 490N500W, and 480N500W; the western edge of the excavation is the south baseline (Fig. 4.2). The block contains 100 one m. squares; each is identified by grid coordinates describing its southeast corner. The 1 m. squares were the operational units within which the actual digging was conducted and provenience control maintained.

The plowzone, level 1, was stripped off to a depth of 20 cm. below ground surface; its actual depth varied from 18 to 21 cm., but averaged 19 cm. Digging was done with hand tools, shovels and trowels, and backdirt from each meter square was screened through a ¼-inch mesh sifter. Because the summer of 1978 in El Dorado was quite hot and dry, the excavation baked out, became hard, and developed numerous desiccation cracks. Liberal amounts of water had to be poured on unexcavated squares to keep the soil soft enough to remove and screen. Plowzone removal was accomplished slowly and carefully, and without the use of heavy machinery, because earlier excavations had shown that if a sub-plowzone occupation layer could be found, it would very likely be thin, difficult to detect, and full of man-made features. As expected, the plowzone contained numerous classes of prehistoric artifacts (such as limestone, chipped stone, bone, pottery, burned earth, and daub) and several different kinds of historic artifacts (such as glass and crockery sherds, fragments of concrete, brimestone, clinker, and brick, plus nails and wire). The plowzone can be described as a friable silty clay loam soil, that was dark grayish-brown (10YR 4/2, moist) in color, and which contained charred and uncharred pieces of crop stubble.

After the plowzone had been removed from each meter square, the floor was moistened, scraped clean, and examined for feature stains. Many such stains were detected and recorded. When plowzone removal was completed over the entire block, the excavation's plan showed 92 possible feature stains and a visible and sharp soil change which ran north-south through the 494N column of one meter squares (Fig. 4.4). In order to enhance the visibility of stains and soil change, the excavation's floor was moistened and scraped clean again. Some of the stains did not show up as well as earlier, but

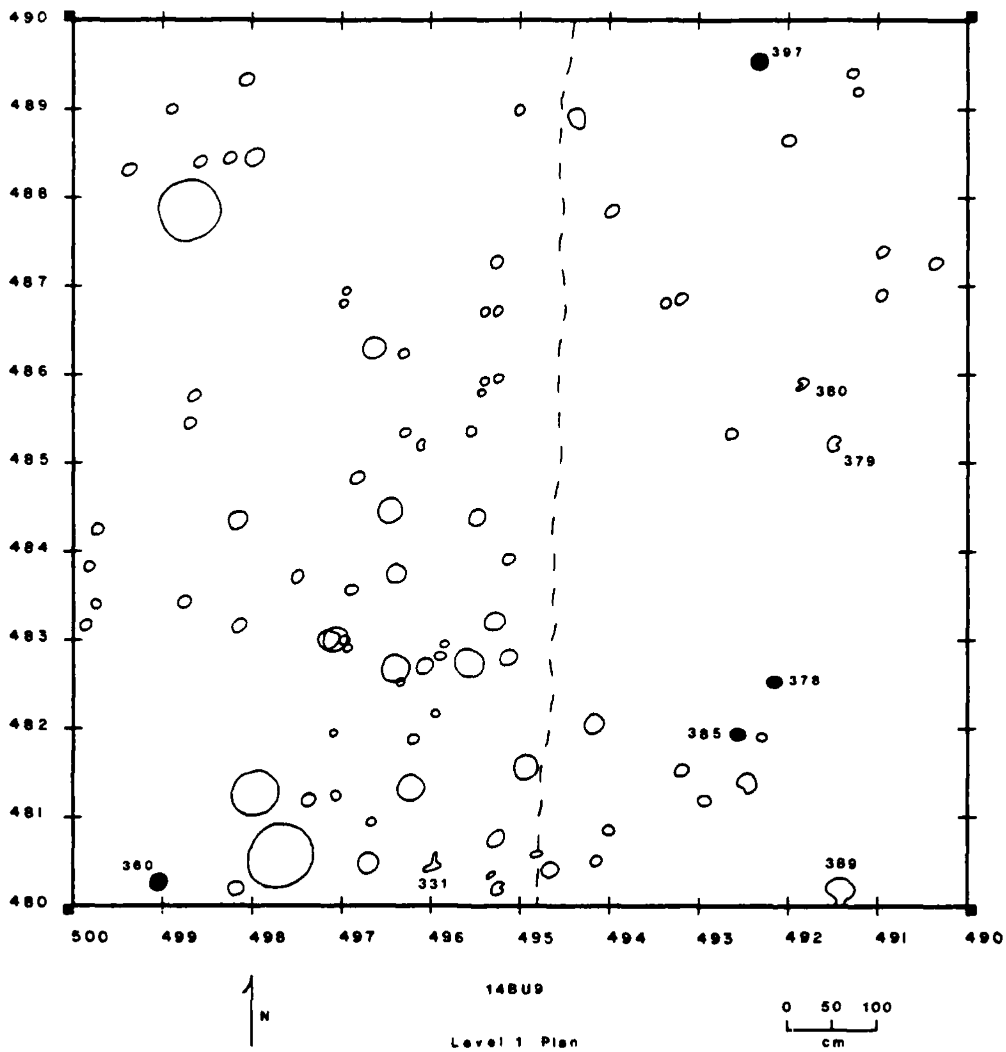

Figure 4.4. Plan view of 10 m. block at bottom of plowzone (level 1, 20 cm.), showing the location of stains and soil change, 14BU9.

most of them were still visible. The soil change was also clearly evident, but its boundary had moved a few centimeters west. The soil unit in the approximate eastern half of the block was a mottled, dark, yellowish-brown (10YR 4/6, moist), friable, fine textured, silty clay. This yellowish-brown clay unit was almost devoid of cultural debris; it is the same sterile soil zone discussed by Bastian (1969) and Grosser (1970, 1973) which stratigraphically separates the site's Woodland deposit from the underlying Archaic deposits. The soil unit in the western half of the block was nearly identical to the plowzone; it was a friable silty clay loam soil, dark, grayish-brown (10YR 4/2, moist), but did not contain crop stubble. When this western soil body was trowelled, it contained the same artifact classes noted above for the plowzone. This dark brown artifact-bearing soil is the intact Woodland occupation zone reported by Bastian (1969).

Simply by stripping off the plowzone in the new block excavation, the existence of an intact Woodland deposit and the underlying sterile clay layer, reported by earlier investigators, had been confirmed. Encouraged by these results, attention was focused on the 92 possible feature stains. Candidate features situated in the excavation's eastern portion were visible as dark brown stains surrounded by yellowish-brown clay. Stains in the block's western half were more difficult to detect because their dark brown color did not differ much from the surrounding dark grayish-brown soil. Each candidate feature's plan dimensions were measured and its location recorded on the level map, then each was cross sectioned to provide a vertical profile view. The cleanly scraped profile was examined for stain configuration and its cultural or noncultural origin determined. Stains diagnosed as prehistoric man-made features were photographed, measured, and described; the internal soil matrix was removed and the photographing, measuring, and describing repeated. The entire fill from each cultural feature was saved for water flotation and screening, and a small sample was set aside for possible mechanical and chemical analyses.

The 92 stains detected at the bottom of the plowzone were diagnosed, in descending order of frequency, as one of four entities: (1) moist desiccation crack; (2) rodent burrow; (3) tree root; or (4) man-made feature. As mentioned above, the hot and dry summer of 1978 desiccated surface soils so badly that wide and deep fissures developed throughout the excavation. When the soil was moistened to aid digging and stain delimiting, the applied water filled desiccation cracks and soaked into the soil. The radial percolation of moisture through the soil created dark and soft stains relative to surrounding soils. Such stains were quickly diagnosed as moistened desiccation crevices even before cross sectioning was completed; they exhibited no textural, structural, or artifactual differences when compared to surrounding soils. Desiccation fissures, of course, were visible as cracks in the soil, especially when carefully profiled, from which darker color and moisture rapidly faded into adjacent soils as distance from the crevices increased. Desiccation cracks were a problem only in the block's western half where soil stains were difficult to detect in the Woodland occupation zone; their numbers and size variation are illustrated by the numerous circles shown on the west half of the excavation's plan view (Fig. 4.4). Because of the yellowish-brown clay and dark color of stains, desiccation cracks were not a problem in the excavation's eastern portion.

Rodent burrows were the second most numerous kind of stain. Many rodent runs were diagnosed as such upon inspection of plan view; they often presented an irregular stain configuration, for example, see numbers 331, 389, 379, and 380 (Fig. 4.4). However, since not all rodent burrows had irregular plan views and rodents sometimes dig through man-made features, even these rather obvious stains were cross sectioned. Filled-in rodent runs, in general, were darker in color, softer, and finer in texture than surrounding soils no matter which soil body they had penetrated in the excavation. Furthermore, in cross section, they usually made an abrupt turn or expanded into a chamber and so were easily diagnosed as rodent disturbances. Tree root stains were also easy to identify because in plan and profile views the stains' outer edges exhibited clay skins and orange oxidation zones. Although they were not as numerous as desiccation cracks or rodent burrows, tree root stains are important because they provide direct evidence that the

Walnut River Valley was partially forested at least once before the advent of modern agriculture. Desiccation cracks, rodent burrows, and tree roots comprised 88 of the 92 stains recorded on the level 1 (0-20 cm., plowzone) plan (Fig. 4.4).

The remaining four stains were prehistoric man-made features; all four were diagnosed as postmolds. In general, the postmolds exhibited a nearly circular plan view (see solid circles, numbered 360, 378, 385, and 397, Fig. 4.4); their internal soil colors were much darker than adjacent soils and each feature's internal fill formed an abrupt and sharp boundary at the stain's edges. In addition to the clearly evident color contrasts, the postmolds were easily delimitable vis-a-vis surrounding soils on the basis of textural, structural, and compactness differentials; their internal fill was very fine in texture, showed no ped structure whatsoever, and was soft and loose. These color, structural, textural, and compactness contrasts characterized each feature's profile view as well. In short, actual man-made features were not difficult to detect, delimit, and diagnose. Postmold 360 was circular in plan view (square 480N499W, Fig. 4.4); its north-south diameter was 20.0 cm. When cross sectioned through the north-south axis, the stain exhibited a basin-shaped profile and a maximum depth of 8.0 cm. (Fig. 4.5). Postmold 378 measured 14.5 cm. north-south and 13.0 cm. east-west, so its plan view was slightly elliptical (square 482N492W, Fig. 4.4). When cross sectioned through its north-south axis, it exhibited a profile with straight sides which slanted slightly to the south, and an asymmetrically rounded bottom (Fig. 4.5). Maximum depth of stain 378 was 18.0 cm. Stain 385 (square 481N492W, Fig. 4.4) had a north-south diameter of 14.0 cm. and a 13.5 cm. east-west diameter; its plan view was nearly circular. This postmold was cross sectioned through its east-west axis; the profile (Fig. 4.5) showed a parabolic stain whose maximum depth was 16 cm. The fourth postmold (stain 397, square 489N492W, Fig. 4.4) also had a slightly elliptical plan view; its diameters were 19.0 cm. east-west

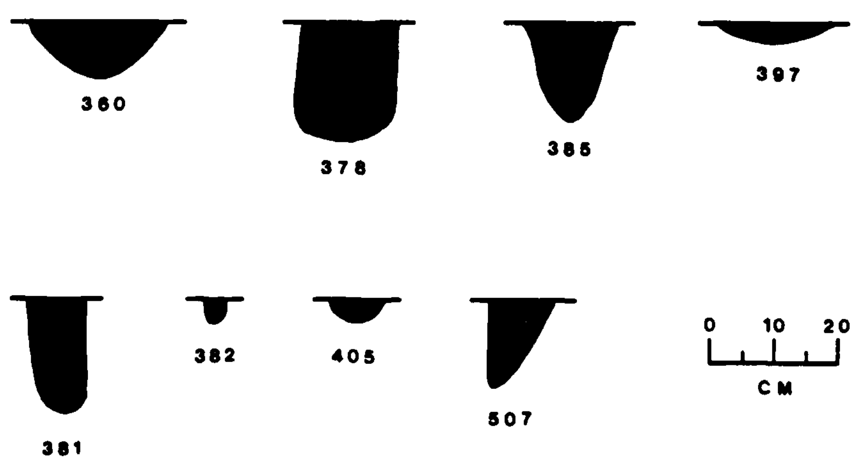

Figure 4.5. Profile view of postmolds, 14BU9.

and 17.0 cm. north-south. Cross sectioned through its north-south axis, the stain had a shallow, rounded profile. Its maximum depth from detection surface was 2.0 cm. (Fig. 4.5). Descriptive data for the cultural features detected at the bottom of the plowzone are summarized in Table 4.1.

Several inferences can be drawn from the postmold descriptions. An examination of Figure 4.4 shows that the cultural features are not distributed within the block in any obvious pattern. Their locations vis-a-vis one another do not exhibit an order that could be cited as evidence indicating the remains of a prehistoric structure, such as a house, arbor, or drying rack. However, most of the postmolds (3 of 4) are situated in the block's eastern half where they intruded the sterile yellowish-brown clay. The westward shift of the boundary separating the western soil body from the clay, the intrusion of three postmolds into the clay, and the occurrence of artifacts in the plowzone above them, demonstrate that: (1) the Woodland occupation zone extended further east in the past; (2) the yellowish-brown clay lies under the Woodland occupation zone; and (3) cultivation has disturbed the Woodland deposit and truncated all the postmolds found at the bottom of the plowzone. The last conclusion is corroborated by the wide range in postmold maximum depths (2.0-18.0 cm., Table 4.1) and by the fact that all were first detected at the bottom of the plowzone. Their surface of origin, i.e., the former land surface from which the features were made, was stratigraphically higher than the bottom of the present plowzone. Since the postmolds may have had different surfaces or origin, it cannot be concluded that the four were made at the same time, or were part of a single structure or structure complex. It is also possible that shallow features which originated at higher former surfaces (recall comments on erosion in the previous section) have been completely destroyed by plowing. The import of the above statements will be made clearer when postmolds found in subsequent levels are discussed; more will also be said about the four level 1 postmolds.

A second level 10 cm. deep (20-30 cm. below ground surface) was excavated from the block's western half. As noted above, the undisturbed Woodland deposit showed a sharp boundary with the sterile clay unit through the 494N column of 1 m. squares (Fig. 4.4), so the eastern edge of level 2 coincided

Table 4.1. Dimensions, location, and identification of prehistoric cultural features detected at 20 cm. (bottom of level 1, plowzone), 14BU9.

Stain Number	Square Number	Diameter (cm.)	Depth (cm.)	Diagnosis
360	480N499W	20.0	8.0	Postmold
378	482N492W	14.0	18.0	Postmold
385	481N492W	13.5	16.0	Postmold
397	489N492W	18.0	2.0	Postmold

with the 495N grid line and the 50 one m. squares west of that line were dug. Since work was being conducted in an occupation zone, field techniques were modified to exploit the increased data potential. Digging was accomplished with shovels and trowels, as before, but any artifact with a dimension greater than 2 cm. was plotted in geometric space. The location of such artifacts was measured to the nearest cm. north and west of the meter square's southeast reference corner, its elevation measured to the nearest cm. with a transit, and the data recorded. Tools, tool fragments, potsherds, and other culturally or chronologically distinctive artifacts less than 2 cm. long were also plotted in three dimensions. Loose backdirt from each control unit was sifted through a ¼-inch mesh screen to recover small cultural debris. In addition, a 17.5 liter (½ bushel) sample of Woodland modified soil was taken from each of the 50 squares for processing by water flotation and screening. Once again, water had to be poured on unexcavated squares to keep the soil soft enough to remove and screen.

In general, the same prehistoric artifact classes found in the plowzone were retrieved from the block's second excavated level. Fewer historic artifacts were recovered than from the plowzone; their intrusive occurrence in the Woodland occupation zone could have resulted from a number of natural processes (Wood and Johnson 1978), but the most likely mechanism is continuous cultivation in conjunction with the periodic development of desiccation cracks. After the 20-30 cm. level had been removed from each meter square, the floor was moistened, scraped clean, and inspected for feature stains. Fewer stains were recorded at 30 cm. than at 20 cm. because the continued use of water to keep the excavation moist effectively eliminated the desiccation crack problem. Thus, when the entire second level had been removed from the 5 by 10 m. block, the excavation's plan showed only 12 possible feature stains and a much smaller area of remaining occupation zone (Fig. 4.6). Although the Woodland midden was present in all 50 units, it was observed to be very shallow in the extreme eastern and northern squares and to become progressively thicker to the west and south. The cultural deposit was underlain by the sterile clay everywhere except in the block's southwest corner where excavation of level 2 did not uniformly encounter sterile clay. The boundary around the Woodland deposit remaining at the bottom of level 2 was not as precise as shown in the plan (Fig. 4.6); the contrasts between the occupation zone and the yellowish-brown clay were not as evident as before, so the illustrated boundary was also drawn from knowledge of artifact distribution on the level's floor (see the distribution analyses below). A semicircular area of midden existed; it was the precise location of its boundary that was indefinite.

The 12 possible feature stains recorded in level 2 were investigated with the same techniques discussed above. All of the stains intruded the yellowish-brown clay and all of them were first detected within the cultural midden. Nine of the 12 stains were either rodent burrows or tree roots; three were diagnosed as postmolds. Postmold 381 was circular in plan view (square 481N498W, Fig. 4.6); its north-south diameter was 8.5 cm. When cross sectioned through its north-south axis, the profile presented a stain with fairly straight sides, an asymmetrically rounded bottom, and a maximum depth of 18.0 cm. (Fig. 4.5). The postmold sloped slightly to the northwest. Stain 382 was nearly circular in plan view (square 481N498W, Fig. 4.6); its

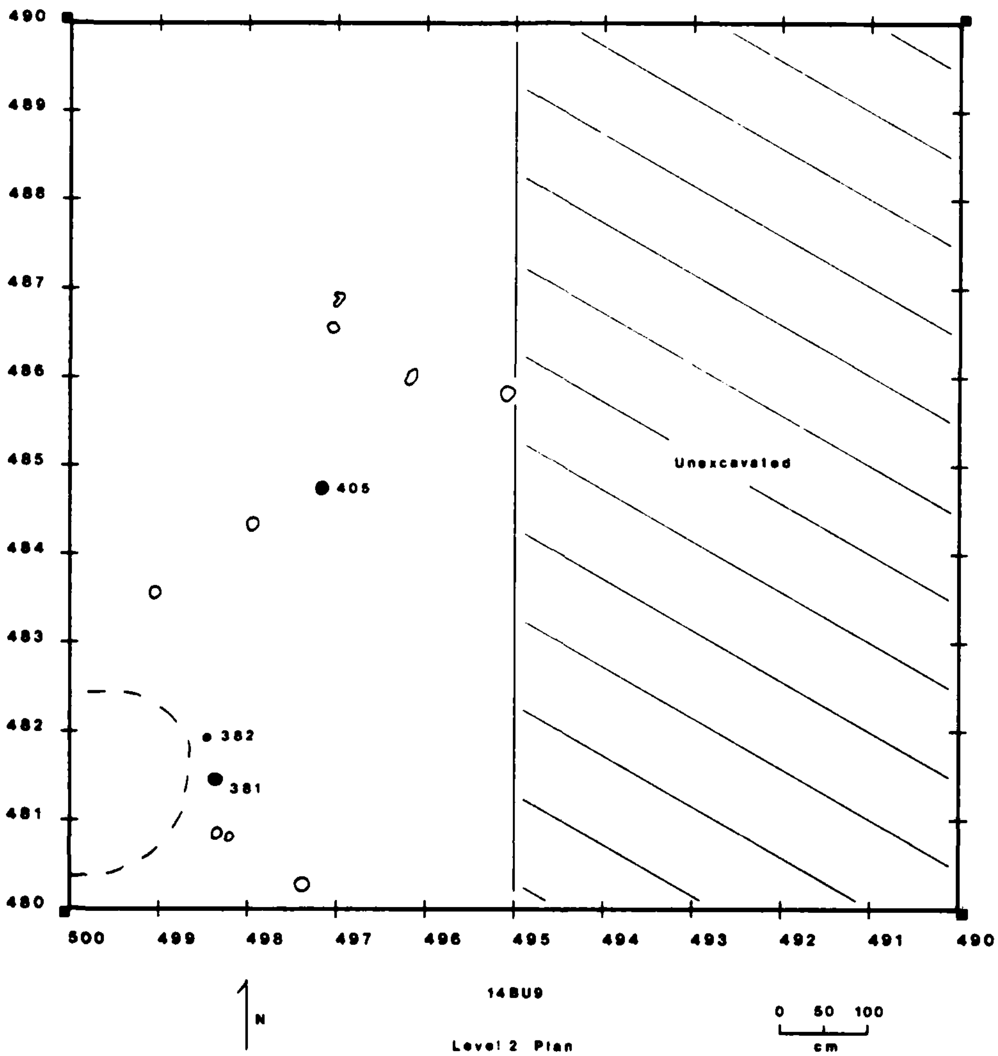

Figure 4.6. Plan view of 5 by 10 m. block at bottom of level 2 (30 cm.), showing the location of stains and soil change, 14BU9.

north-south diameter was 3.0 cm. Also cross sectioned in a north-south direction, the postmold's profile exhibited a straight-sided, round-bottomed stain which was 4.0 cm. deep (Fig. 4.5). Postmolds 381 and 382 were first detected at precisely the same elevation when measured with the transit; they were also located just beyond the eastern boundary of the small area of cultural midden remaining at 30 cm. Postmold 405 had a circular plan (square 484N497W, Fig. 4.6); its diameter was 8.0 cm. When cross sectioned through its east-west diameter, stain 405 showed a symmetric, basin-shaped profile and a maximum depth of 3.5 cm. (Fig. 4.5). Descriptive information on the three postmolds is summarized in Table 4.2.

Table 4.2. Dimensions, location, and identification of prehistoric cultural features detected in level 2 (20-30 cm.), 14BU9.

Stain Number	Square Number	Diameter (cm.)	Depth (cm.)	Diagnosis
381	481N498W	8.5	18.0	Postmold
382	481N498W	3.0	4.0	Postmold
405	484N497W	8.0	3.5	Postmold
507	481N501W	9.0	14.5	Postmold

An inspection of Figure 4.6 indicates that two of the postmolds, 381 and 382, may be ordered in a meaningful manner with respect to the remaining occupation zone. The circular configuration of the cultural midden and the occurrence of a pair of postmolds along its eastern edge suggest that the excavation truncated the remains of a Woodland house. If Woodland people had scooped out a roughly circular, basin-shaped pit, and built a house over that pit by driving or setting posts around its perimeter, then, upon excavation, one could expect to detect the house's remains as a circular stain with postmolds around the perimeter. Several lines of evidence converge to give partial support to this prehistoric dwelling hypothesis. The intact cultural deposit within and around the posited house contained the greatest concentration of artifacts, such as daub, burned earth, bone, etc. This high artifact density is partially a function of greater midden thickness in the same area, but if a house was abandoned and subsequently filled with trash, then it could be expected that the house's remains contain a particularly high artifact concentration, even when greater midden thickness is taken into consideration. The analysis of artifact distributions in the next section is designed to elucidate and test this differential artifact density hypothesis. Furthermore, if all the postmolds found at 20 and 30 cm. are displayed with the remaining occupation zone on the same plan view (Fig. 4.7), an additional postmold (number 360) is seen to lie just outside the posited house stain. The other four postmolds do not appear to be related to the possible dwelling or to each other.

As mentioned above, postmolds 381, 382, and 405 were first detected in level 2, i.e., between 20 and 30 cm. below ground surface. Their surfaces of origin may be identical, but cannot be conclusively demonstrated because the detection of former habitation surfaces within a relatively homogeneous occupation zone in an open site, like Snyder, is usually difficult. In these circumstances, one way to locate a living surface is to correlate the surface of detection elevations of prehistoric features. However, there is always a certain inherent error separating surfaces of origin and surfaces of detection in terms of the need to observe color, textural, and structural

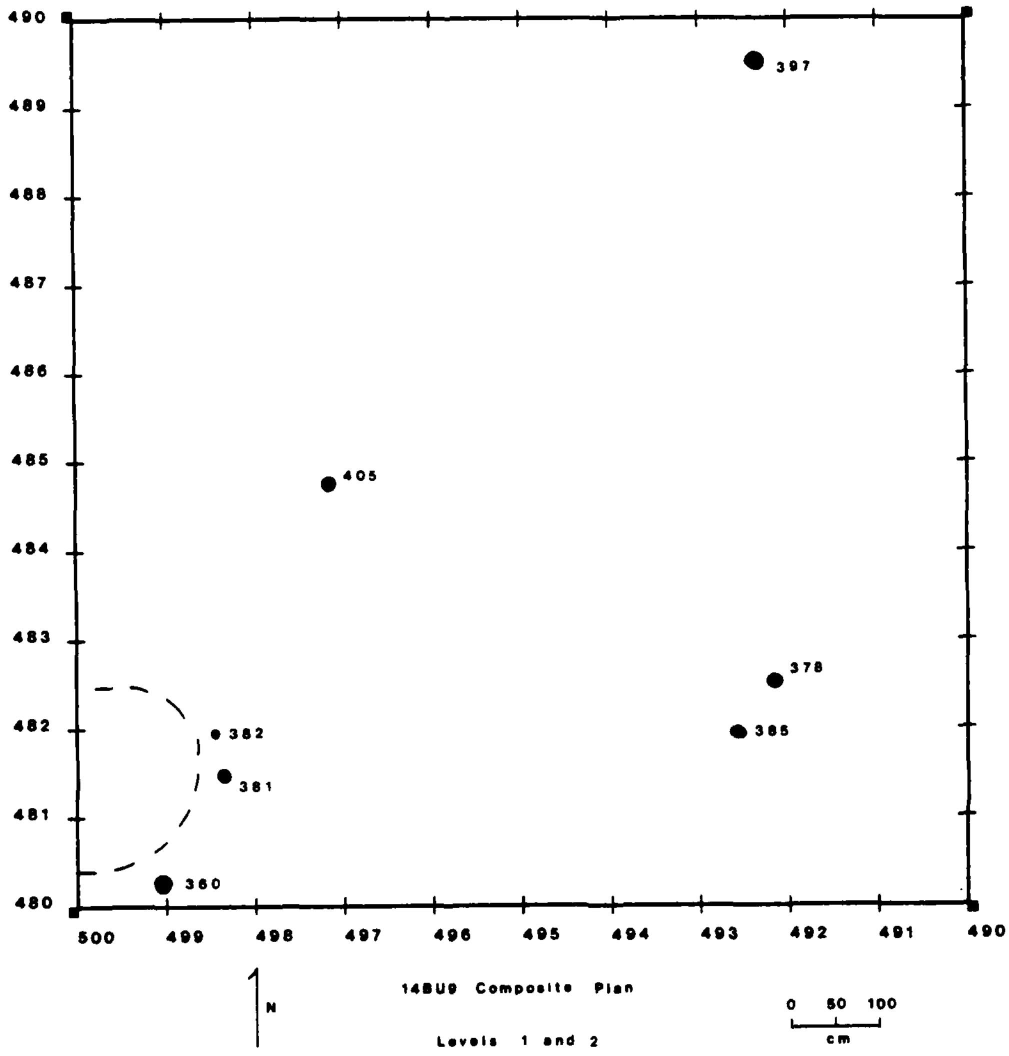

Figure 4.7. Composite plan of levels 1 and 2 showing postmold distribution and relationship to remnant midden stain, 14BU9.

contrasts. By the time such contrasts are clearly evident, the surface of detection is generally lower than the surface of feature origin. Given the thinness of the intact Woodland deposit, the fact that no actual living surface was observed within the midden (and that a good case cannot be made for one from the three level 2 postmolds) and the inescapable differences in surfaces of origin versus detection, it is possible that all seven postmolds (Fig. 4.7) originated from: (1) different habitation surfaces at different times; (2) the same surface at different times; or (3) the same surface at the same time. In other words, the occurrence of postmolds 381, 382, and 360 around the edge of the circular stain may either be fortuitous

or the interrelated remains of a house. The intent here is not to ambiguously equivocate over the information presented, but to be explicit about the strength of the evidence for or against the prehistoric dwelling hypothesis. A viable, but inconclusive, case can be made from present data for either position.

There was not enough time left at the end of the 1978 field session to complete level 3 (30-40 cm. below ground surface). The intent was to remove another 10 cm. level from a 2 by 3 m. block in the excavation's southwest corner (contained within coordinates 480N500W, 480N498W, 483N498W, and 483N500W, see Fig. 4.6). This procedure was designed to continue excavation of the remaining portion of the midden and to provide a profile view (in the west wall) of the posited house stain. However, only four of the six squares were actually dug: 480N498W, 480N499W, 481N498W, and 481N499W The excavation techniques, sampling, and recording procedures were identical to those described above for level 2. No historic artifacts or feature stains were found, but the same prehistoric artifact classes recovered from the plowzone and level 2 were retrieved in the block's third excavated level. As expected, the posited house stain shrank in size but was still visible, even though its boundaries were indistinct, on the cleanly scraped 40 cm. floor. The sterile yellowish-brown clay had been encountered in most of the excavation. Artifacts were numerous throughout the semicircular stain. The most interesting result from this additional, but limited, work is that the block's west wall profile (Fig. 4.8) showed a large basin-shaped stain filled with Woodland midden. This finding supported the prehistoric dwelling hypothesis and strongly suggested that more work on the Woodland occupation zone was warranted.

When the Snyder site excavation was opened up again during the field season of 1979, part of the crew was assigned the task of testing the Woodland dwelling hypothesis entertained in 1978. The proposition that was tested is: "If Woodland people had scooped out a roughly circular, basin-shaped pit, and built a house over that pit by driving or setting posts

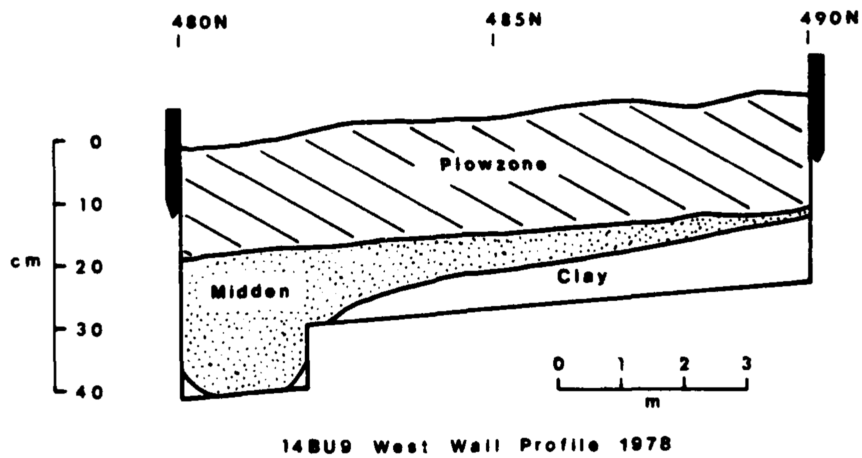

Figure 4.8. Profile of the excavation's 1978 west wall showing configuration of Woodland midden (notice vertical exaggeration), 14BU9.

around its perimeter, then, upon excavation, one could expect to detect the house's remains as a circular stain with postmolds around the perimeter." In order to enable the excavators to obtain relevant information, a 3 by 4 m. block was laid out over the posited house so as to include the one square meter control units previously dug and the unexcavated meter squares expected to contain the rest of the house's remains. If the stain and postmold configuration recorded in 1978 was indeed symmetrical, the new excavation's 12 square meters were expected to adequately expose the anticipated feature complex. Thus, the 1979 Woodland block was contained within grid coordinates 480N498W, 480N502W, 483N502W, and 483N498W (Fig. 4.9); if necessary, the excavation's size or shape would have been adjusted in response to unanticipated results.

The plowzone in the six meter squares west of the 500W grid line was rapidly stripped off to 20 cm. below surface. Backdirt was not screened because dry sifting of the plowzone during the previous year had provided

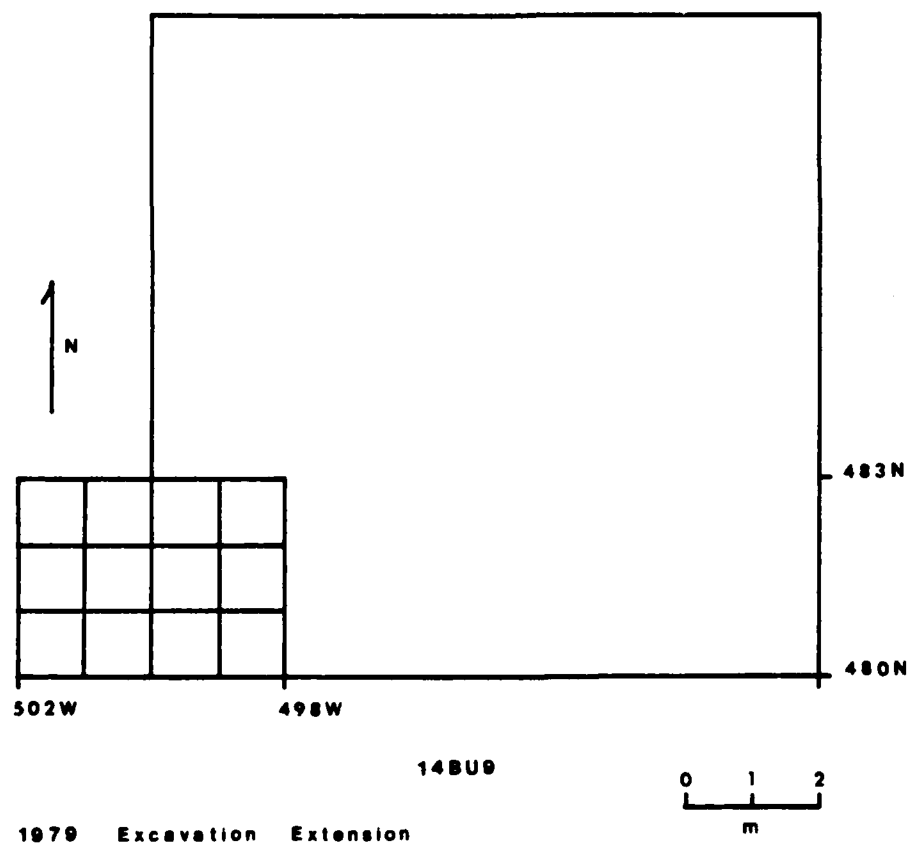

Figure 4.9. Plan view of block excavation showing location of area modified for investigation of probable Woodland house, 14BU9.

limited information and was time consuming. Artifacts were retained whenever they were encountered, and the removed soil was sorted through by hand to aid additional recovery. The floor of this first level was trowelled clean and inspected for possible feature stains. No such stains were observed, but the floor in all six squares was comprised of the dark intact cultural midden noted the previous season and described above. This small area of removed plowzone (level 1, 0-20 cm. below surface) contained the same historic and prehistoric artifact classes as before.

In order to guarantee comparability with the previous season's work, all subsequent 10 cm. levels in the new block were excavated with the field techniques described above for careful work in undisturbed occupation zones. The second level excavated (20-30 cm. below surface) in the six squares west of the 500W grid line was expected to reveal the posited house stain and perimeter postmolds, since that particular level in the previous year's work yielded stain configurations from which the hypothesis was originally formulated. However, when removal of this second level was completed, no house pit could be seen; the anticipated semicircular stain west of the 500W grid line was not there. Furthermore, there was little evidence for the former existence of the posited perimeter postmolds; in fact, only one small circular stain was encountered in level 2 and it was located right where a perimeter postmold should have been if the dwelling hypothesis was correct (Fig. 4.10). When investigated in conformance with the techniques described above for possible features, stain 507 exhibited the color, structural, textural, and compactness contrasts in both plan and profile views characteristic of man-made features at 14BU9; from those observations, as well as the stain's size and shape, the feature was diagnosed as a postmold. Postmold 507 was circular in plan view (square 481N501W, Fig. 4.10); its diameter was 9.0 cm. When cross sectioned through its north-south axis, the stain exhibited an asymmetrical profile; its south side was straight and vertical, the north side slanted toward the south side, and its bottom was slightly rounded (Fig. 4.5). After its internal fill was removed, the postmold was found to slant slightly to the south; its maximum depth was 14.5 cm. Descriptive data for postmold 507 are included in Table 4.2.

In addition to their utility for distinguishing cultural features from other kinds of soil disturbance, feature cross sections may provide information on internal matrix microstratigraphy and modes of construction. None of the eight postmold profiles showed any internal structural differentiation, but their outline configurations (Fig. 4.5) and size dimensions (Tables 4.1 and 4.2) show considerable variation. Prehistorically, posts were probably erected in two ways: (1) by being driven into the soil; and (2) by being placed in a dug hole. Theoretically, the two techniques of prehistoric post erection should be discriminable from inspection of postmold profiles (Krause and Thorne 1971). Post setting with hand tools would have involved: (1) digging a posthole; (2) placing a post in the hole; and (3) packing soil and/or other debris around the post to maintain it in a upright position. If the Snyder site postholes were dug by hand, perhaps aided by a digging stick or scoop, the cross sectioned postmolds should have a diameter large enough to accommodate a human hand and a total depth that does not exceed the reach of a human arm. Krause and Thorne also suggest

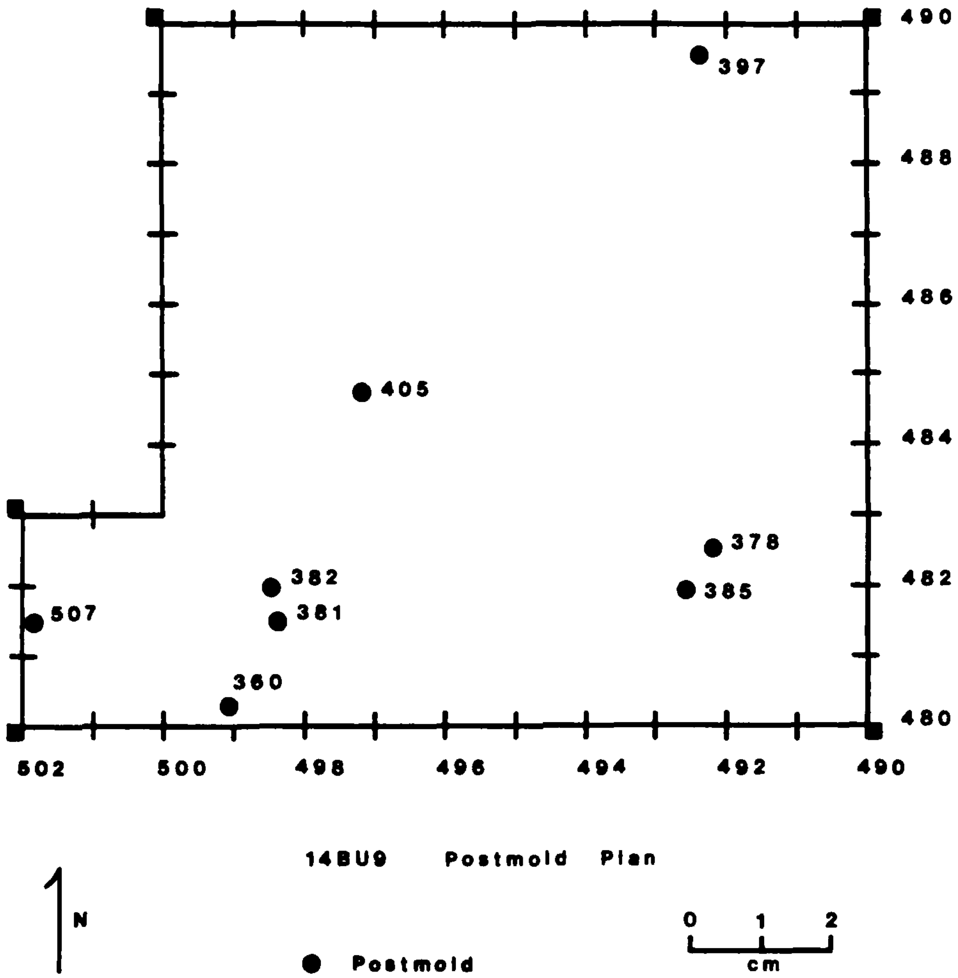

Figure 4.10. Plan view of block excavation showing location of new postmold (507) in relation to previously excavated postmolds, 14BU9.

(1971) that dug postholes should have flat or basin-shaped bottoms. Post driving with hand tools would have involved: (1) sharpening an end of the post; and (2)pounding or pushing the post into the soil to maintain it in an upright position. If posts were driven, the cross sectioned postmolds should have a pointed bottom (according to Krause and Thorne 1971), they probably could not have been thrust or pounded very deeply into the ground, and there would be upper and lower limits on the posts' diameters (very large timbers would have been difficult to drive and very small posts would have been structurally weak).

Postmolds 381, 382, 405, and 507 have diameters that are probably too small for hand-dug postholes (Table 4.2). A 3.0 cm. diameter is certainly too small and a 9.0 cm. diameter is probably a tight squeeze even for a

small feminine hand; experiments conducted by the author suggest that 12.0 cm. are a workable minimum diameter for hand-dug postholes. From the feature's pointed bottom, restricted diameter, and shallow depth, it may be plausibly inferred that postmold 507 is the remains of a driven post. Likewise, even though the bottoms of postmolds 381, 382, and 405 are not pointed, their restricted diameters and relatively shallow depths suggest that they are the remains of driven posts. The diameters of postmolds 360, 378, 386, and 397 would easily have accommodated a human hand and appear to be too large to represent posts pounded or pushed into the ground (Table 4.1). Since all four were truncated by cultivation, their measured depths cannot be used to help determine their mode of construction. Profile configurations and diameters, then, suggest that postmolds 360, 378, 385, and 397 are the remains of set posts; actual post diameters must have been less than posthole diameters. The distribution of pointed and nonpointed bottoms among large and small diameter postmold profiles (Fig. 4.5) indicates that diameter is a better criterion for distinguishing driven from set posts than the presence or absence of pointedness. In any event, the postmold diameter measurements (Tables 4.1 and 4.2) have two size clusters. The large postmolds have diameters greater than 12.0 cm.; small postmolds have diameters less than 10.0 cm.

The inferences drawn from postmold descriptions in the above paragraphs were based on the tacit assumption that the features are, in fact, prehistoric. Since postmolds 381, 382, 405, and 507 were first detected within the intact occupation midden, they have to be temporally associated with that occupation zone. Stratigraphically, those four features could not have originated from a surface later in time (or higher in elevation) than the Woodland deposit. The four postmolds (360, 378, 385, and 397) detected at the bottom of the plowzone, however, may not have originated from a prehistoric habitation surface. A local informant (Robert Holmes, El Dorado, Kansas) told the excavation crew that the Snyder site area had been used as a construction camp when the railroad on the site's western edge was built. This fact accounts for the historic artifacts found in the plowzone, and also presents the possibility that the postmolds recorded at the bottom of the plowzone are historic rather than prehistoric. An examination of Tables 4.1 and 4.2 shows, for example, that the large diameter postmold group was found at the bottom of the plowzone, whereas the small diameter group was found within the Woodland deposit. The stratigraphic separation of large and small postmold surfaces of detection seems to suggest that the larger diameter features are of historic construction.

There is little information on what kinds of activities construction workers participated in at their camp or what sort of camp structures may have been built. The presence of historic nails, wire, and small pieces of concrete may represent the remains of storage sheds, etc., or may just be scattered trash. Other than cultivation, there was no evidence in the excavation for disturbance of the soil by man during historic times. Two sets of data indicate that all the postmolds are prehistoric. First, the variation (of diameters and plan and profile views) exhibited by the eight postmolds is normally expected of prehistoric features. A well equipped railroad construction crew would have had posthole augers which, if used on the site, would have produced postmolds that exhibit much less size and

shape variability. Furthermore, when the internal fill of the eight features was water screened (see Root, Chapter 6, this volume, for details), all of them contained prehistoric artifacts (Table 4.3). Historic postholes could have been backfilled with prehistoric midden, of course, but it is important to note that none of the features contained any historic debris whatsoever. All eight features contained prehistoric material, none of them contained historic material, and all of them were filled with dark midden soil. These data, in conjunction with the variability in stain configurations, indicate that features 360, 378, 385, and 397 can be accepted as prehistoric postmolds. The amount of prehistoric debris found in any given feature is related to its volume (Table 4.3).

Recall that the previous season's work in level 2 determined that the same artifact classes recovered in the plowzone were also found in the cultural zone below it, that the intact cultural midden got thicker as one moved from east to west and north to south in the excavation, and that artifact density was greatest within and around the posited house. The removal of level 2 from the six squares west of the 500W grid line in 1979 revealed that the same general artifact classes were present, but that artifact density was much lower than anticipated; in fact, artifact density in those six squares was significantly lower than the density in the six adjacent squares (to the east) excavated in 1978 (Fig. 4.10). Furthermore, the

Table 4.3. Water flotation and screen recovery of internal feature fills, 14BU9.

Postmold Number	Burned Earth	Chipped Stone	Bone	Charcoal	Limestone	Volume (l.)
378	11+	33	3	+	-	2.7
360	13+	5	-	-	-	2.5
385	20+	11	-	+	1	2.2
381	6+	4	3	-	-	1.0
507	*+	*	-	+	-	0.9
397	+	6	-	+	-	0.5
405	4+	4	-	-	-	0.2
382	5+	1	1	-	-	0.03

+ indicates small fragments too numerous to separate and count.
* indicates fill processing is not complete, but speciments are present.

removal of level 2 from the six new squares in 1979 revealed that the sterile yellowish-brown clay had been uniformly exposed on the freshly trowelled 30 cm. (below surface) floor. Thus the intact cultural midden did not continue to increase in thickness as expected in the southwest corner of the excavation, and, as noted above, the anticipated house stain was not observed.

The absence of a house stain with associated postmold perimeter, the low artifact density, the disappearance of the intact cultural midden, and the uniform appearance of the culturally sterile yellowish-brown clay constitute strong evidence against the prehistoric dwelling hypothesis. However, the semicircular stain and postmolds observed in 1978 and the postmold discovered in 1979 presented the investigators with a serendipitous problem, i.e., if the nebulous semicircular stain and the four postmolds are not the remains of a house, then what are they? Since the removal of level 2 in the six 1979 squares produced largely negative results, there was no apparent justification for expanding the Woodland excavation horizontally. The excavation level 3 (30-40 cm. below surface) from four squares in 1978, however, had resulted in the recovery of Woodland artifacts as well as a small and intact remnant of cultural midden, but was not finished at the end of the field season. A solution to the problem of assessing the significance of the four postmolds, the nebulous remnant midden stain, and their interrelationships was sought by excavating two additional levels.

Level 3 (30-40 cm. below surface) was removed from the six squares west of the 500W grid line and the two squares left unfinished from the previous summer (482N498W and 482N499W, Fig. 4.10). Level 4 (40-50 cm. below surface) was excavated from the entire 3 by 4 m. block. Both levels were dug with the standard suite of techniques described above. The level 3 matrix was composed entirely of yellowish-brown clay, but was not, strictly speaking, devoid of artifacts. Even though the 30-40 cm. cut contained no intact cultural midden and no features, a small number of artifacts (especially pieces of chipped stone, burned earth, and bone) were recovered in nearly every square. The presence of small amounts of cultural debris in the yellowish-brown clay is a result of natural pedoturbation processes (cf. Wood and Johnson 1978) rather than prehistoric human behavior (see artifact analyses below). The excavation of level 4 resulted in the recovery of a larger number of artifacts per square than level 3, but this can be attributed to pedoturbation in the clay which composed the upper 6 to 8 cm. of the level and the presence of a gray soil unit, known from previous work (Grosser 1970, 1973, 1977) to contain the Walnut phase Archaic component, which comprised the lower 2 to 4 cm. of the level. Thus higher artifact counts in level 4 squares were a result of mixing together the products of natural pedoturbation processes and human behavior when the level was dug. Removal of levels 3 and 4 produced no features and no culturally or chronologically diagnostic artifacts. In fact, excavation of those two additional vertical cuts resulted in no substantive information which could be applied to the problem of ascertaining the significance of the four postmolds and the Woodland midden remnant observed in 1978. This problem, among others, guided the artifact analyses offered below.

Profile views of the excavation's west and south walls (Fig. 4.11) show the stratigraphic relationships of plowzone, occupation zone, and yellowish-

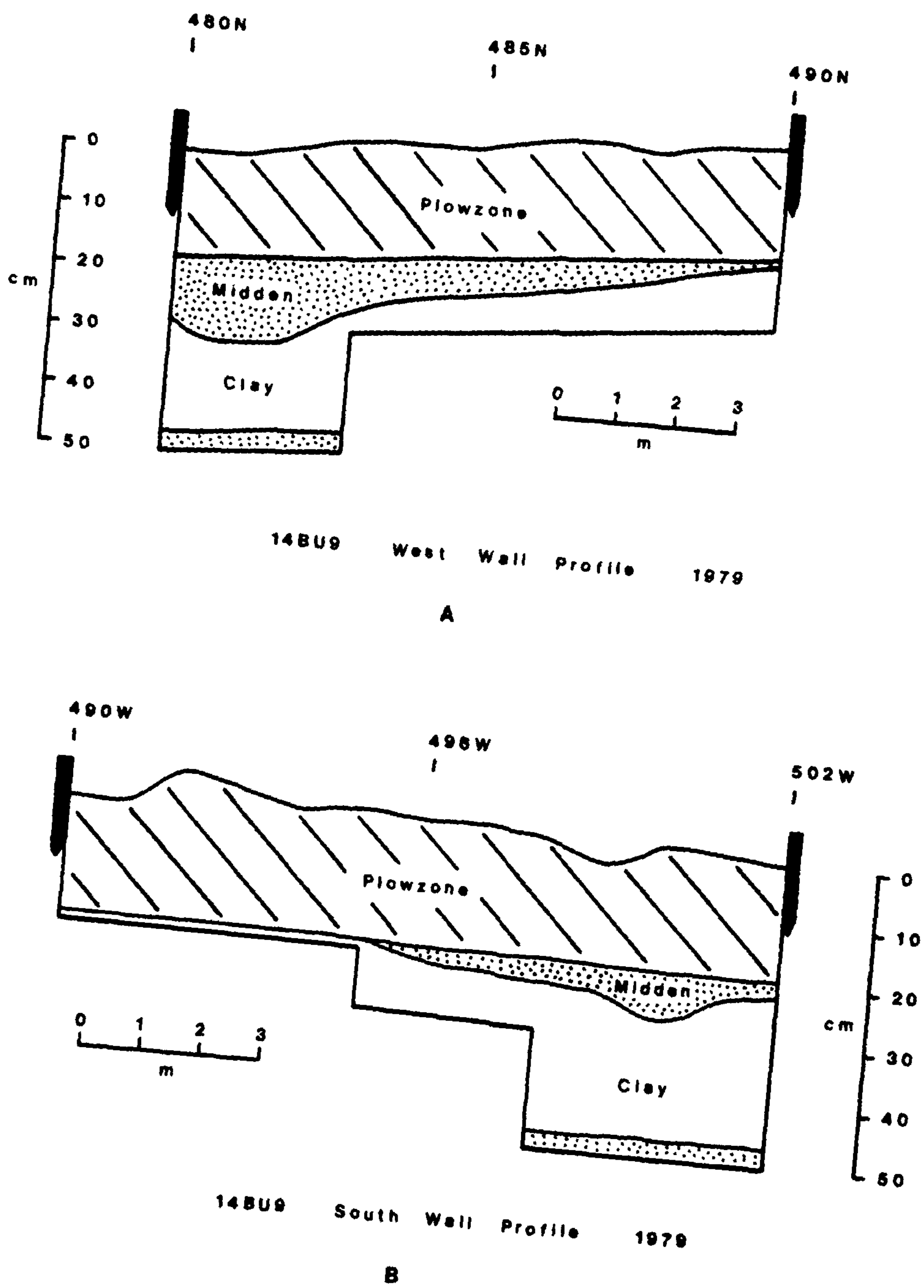

Figure 4.11. Profiles of the excavation's west and south walls, 14BU9.

brown clay units. The plowzone has already been described as a friable, silty clay loam soil, dark, grayish-brown in color (10YR 4/2, moist) which contained crop stubble and several classes of prehistoric and historic artifacts. The Woodland occupation zone is a friable silty loam with granular structure, dark, grayish-brown in color (10YR 4/2, moist), which did not contain crop stubble but did contain _in situ_ prehistoric artifacts and features, and intrusive historic artifacts. The underlying clay was described as a friable, fine textured, mottled, dark, yellowish-brown soil moist) silty clay, which contained small numbers of prehistoric artifacts and intrusive prehistoric features. When the 1979 Woodland block was excavated to a depth of 50 cm. below surface, a very dark, grayish-brown soil (10YR 3/2, moist) was encountered beneath the yellowish-brown clay; this lowermost soil body also contained prehistoric artifacts and is the soil within which Grosser (1970, 1973, 1977) found the Late Archaic, Walnut phase component. All recorded prehistoric features were first detected either at the bottom of the plowzone or within the Woodland occupation zone, most of the postmolds intruded the yellowish-brown clay unit, and some of them intruded the dark grayish-brown unit.

Some soil bodies observed in the 14BU9 excavation resemble soil horizons in the Vanoss silt loam (U.S.D.A. 1975, Sheet Number 29 and pp. 21). The Vanoss soils are deep, found on terraces, and formed in he loamy sediments of stream valleys. An uncultivated and undisturbed Vanoss silt loam has four horizons (U.S.D.A. 1975:21):

A1 0-12 inches (0-30 cm.) dark-gray (10YR 4/1) silt loam, very dark gray (10YR 3/1) when moist; moderate, fine, granular structure; slightly hard when dry, very friable when moist; numerous open pores; slight grayish coatings on peds in lower part; slightly acid; gradual, smooth boundary.

B1 12-18 inches (30-46 cm.), dark grayish-brown (10YR 4/2), light silty clay loam, very dark grayish-brown (10YR 3/2) when moist; moderate, fine and very fine, subangular blocky structure; hard when dry, friable when moist; many open pores; slightly acid; gradual, smooth boundary.

B2t 18-35 inches (46-89 cm.), brown (7.5YR 5/3) silty clay loam, dark brown (7.5YR 4/3) when moist; strong, fine and very fine, blocky structure; hard when dry, friable when moist; many open pores; few, thin, patchy clay films; few very fine black concretions; slightly acid; gradual, smooth boundary.

B3 35-57 inches (89-144 cm.), brown (7.5YR 5/4) light silty clay loam, dark brown (7.5YR 4/4) when moist; weak, medium, blocky structure; hard when dry, friable when moist; few, thin, patchy clay films; few very fine black concretions; slightly acid.

The Snyder site plowzone, Woodland occupation zone, and yellowish-brown clay unit appear to fall within the ranges of variation specified for the Vanoss

silt loam's A1, B1, and B2t horizons. Differences between the Snyder profile and the Vanoss silt loam profile are due to modification of the A1 and B1 horizons by cultivation in modern times and occupation in prehistoric Woodland times. The most interesting differences, however, are the apparent absence of a B3 at Snyder, the shallowness of the Snyder solum relative to that reported for a Vanoss silt loam, and the presence of a buried soil containing Late Archaic occupations on Snyder that does not fit any horizon described for the Vanoss solum. In short, the geological and paleoenvironmental significance of the sediment stratigraphy at 14BU9 are currently enigmatic and should be investigated in detail.

Artifact Analyses

The hypothesis that was generated from observations in the 1978 block, and subsequently tested and rejected by information obtained from the modified excavation in 1979, was that Woodland people had scooped out a roughly circular, basin-shaped pit, and built a house over that pit by driving or setting posts around its perimeter. Evidence presented in the previous section does not support the "house built over a pit" proposal since no pit was detected. However, there is the enigmatic postmold configuration (postmolds 360, 381, 382, and 507, Fig. 4.10), and an area of high artifact density which occurred within the feature configuration. Even though the "house built over a pit" hypothesis is not tenable, the possibility that the four postmolds represent the remains of some kind of house or structure must be entertained. Thus, a modified hypothesis asserts that Woodland people constructed a house on a former living surface by setting or driving some posts into the ground to provide a stable framework. Under this proposal some, but not all, house posts would have left delimitable postmolds and such posts may account for the feature configuration in question. The artifact concentration recovered in the eastern end of the configuration may have resulted from activities conducted inside such a dwelling or from trash disposal upon or within the house area. Artifact analyses offered in the paragraphs which follow examine the spatial distribution of artifact classes in order to determine the validity of the modified Woodland dwelling and activity area hypotheses.

The recent Snyder site excavation, designed specifically to explore the nature of the Woodland occupation in subarea A, investigated a total of 28.0 cubic meters of deposit and resulted in the recovery of 11,570 artifacts (Table 4.4). The reduction in number of excavated units, cubic meters of fill, and recovered artifacts per level is a function of the steady decrease in size of intact Woodland occupation zone as the excavation progressed to 30 cm. and a change in field problems from 30-50 cm. below ground surface. The jump in artifact density per cubic meter of deposit from 582.7 in level 2 to 1035.0 in level 3 reflects the artifact concentration contained within the feature configuration mentioned above. Given that the four excavated cuts varied in depth and area covered (Table 4.4), the artifact assemblage is broken down into more specific artifact classes and displayed as counts per level in Table 4.5. The more numerous prehistoric artifact classes (chipped stone, burned earth, limestone, bone, rotten chert, daub, and charcoal) were found in all four levels; the less numerous prehistoric classes (pottery, sandstone, quartzite, hematite, limonite, and quartz) were retrieved predominantly in the two upper levels. Historic artifacts (nails,

Table 4.4. Cubic meters of excavated deposit and recovered artifact density per level, 14BU9.

Level+	Number Units*	Cubic Meters	Number Artifacts	Artifact Density
1	100	20.0	6724	336.2
2	56	5.6	3263	582.7
3	12	1.2	1242	1035.0
4	12	1.2	341	284.2

+Level 1 was 20 cm. in depth; levels 2, 3, 4 were 10 cm. in depth.
*All units were 1 by 1 m. squares.

glass, concrete, brimstone, brick, cinders, lead/shot, wire, and crockery were recovered only in cuts 1 and 2. When spatial distributions of artifacts and artifact classes are considered and compared below, it will be important to recall the variable sample sizes of the artifact classes and that the excavated levels represent smaller and smaller volumes of deposit. In general, the analytical focus of this section emphasizes the more numerous artifact classes (because it is difficult to discuss the distribution of one limonite specimen, for example) and relates the distribution of items in levels 1, 3, and 4 to the distribution of comparable materials in level 2 (because the latter represents the largest excavated deposit of undisturbed Woodland occupation zone on 14BU9).

Before discussing specimen distributions and their relationships to the prehistoric dwelling and activity area hypotheses, some conventions are adopted for the presentation of distributional data. Artifact counts for each excavated meter square in the level under study are presented in tables in matrix form and visually displayed in planimetric maps. The construction of such tables and maps (and the conventions that are followed) in this chapter are illustrated within the context of a preliminary problem, viz., it must be shown that there is, in fact, an artifact concentration within the confines of the postmold configuration. Recall from the previous section that the intact Woodland occupation zone observed during the removal of level 2 was quite thin along its eastern boundary and in the northern tier of units, and that the midden got progessively thicker as one moved south and west in the block. The problem that arises from this situation is whether the artifact concentration noted in the block's southwest quadrant is solely a function of increased midden thickness or is an area of notable specimen concentration even after adjustment is made for greater midden thickness.

Table 4.5. Vertical distribution of artifact classes, 14BU9.

Artifact Class	Level 1	2	3	4	Totals
Chipped Stone	4107	1507	390	93	6097
Burned Earth	723	951	339	70	2083
Limestone	1352	291	177	26	1846
Bone	136	305	208	108	757
Historic	210	44	0	0	254
Daub	33	89	72	1	195
Rotten Chert	118	36	10	27	191
Charcoal	11	23	45	16	95
Pottery	25	10	0	0	35
Sandstone	4	4	1	0	9
Quartzite	3	1	0	0	4
Hematite	1	1	0	0	2
Limonite	0	1	0	0	1
Quartz	1	0	0	0	1

Total artifact counts for each meter square excavated in level 2 are offered in matrix form in Table 4.6. The artifact count for every unit in Table 4.6, and similar tabulations of distribution data in this chapter, can be located by finding the number where the square's north and west grid coordinates intersect; for example, the total number of artifacts recovered in unit 483N498W is 69. North grid coordinates occur as the first column of numbers on the left; west grid coordinates occur as the first row of numbers at the top. Numbers representing grid coordinates are followed by capital letters which indicate grid direction, excavation unit values have no such indicators. Dashed (-) cells show the location of unexcavated meter squares; excavated squares from which no artifacts were recovered contain the value zero (0). Data presented in such a manner should not confuse the reader familiar with archeological grid systems since the individual unit locating techniques are identical. While it is, perhaps, unusual, the maxtrix

Table 4.6. Total artifact counts per square in level 2, 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	42	23	11	14	24
488N	-	-	8	27	29	30	27
487N	-	-	78	39	24	18	8
486N	-	-	92	45	25	13	9
485N	-	-	76	41	11	17	3
484N	-	-	40	102	123	40	2
483N	-	-	74	69	87	151	18
482N	14	15	169	99	67	115	37
481N	25	41	456	156	26	41	18
480N	2	27	355	104	24	20	12

form of data tabulation is adopted wherever appropriate throughout this chapter as a space saving technique.

A quick scan of Table 4.6 reveals that there is an apparent concentration of artifacts in square 481N499W which may include portions of some surrounding units. This information is more conveniently visualized when displayed as a simple planimetric map (Fig. 4.12). The second convention adopted in this chapter, planimetric maps usually accompany tables of distribution data for level 2 presented in matrix form. Each such map illustrates the excavated portion of the level under discussion as a gridded area, where the grid lines represent one m. intervals; unexcavated portions are not gridded. The relative degree of shading in every meter square (from no shading through 1 to 5 dots through complete shading) indicates the relative number of artifacts recovered in the unit; squares with larger numbers of specimens have greater degrees of shading. In general, the planimetric maps displayed in this chapter exhibit seven or less degrees of shading so that specimen counts can be visually compared to reveal patterns in the raw distribution data irrespective of magnitude differences among artifact class sample sizes. Thus, under this convention, for example, the loci of high and/or low chipped stone concentrations (a numerically large artifact class) can be compared to similar concentrations of pottery (a numerically small class, Table 4.5). The interval length for each degree of shading is computed by dividing the

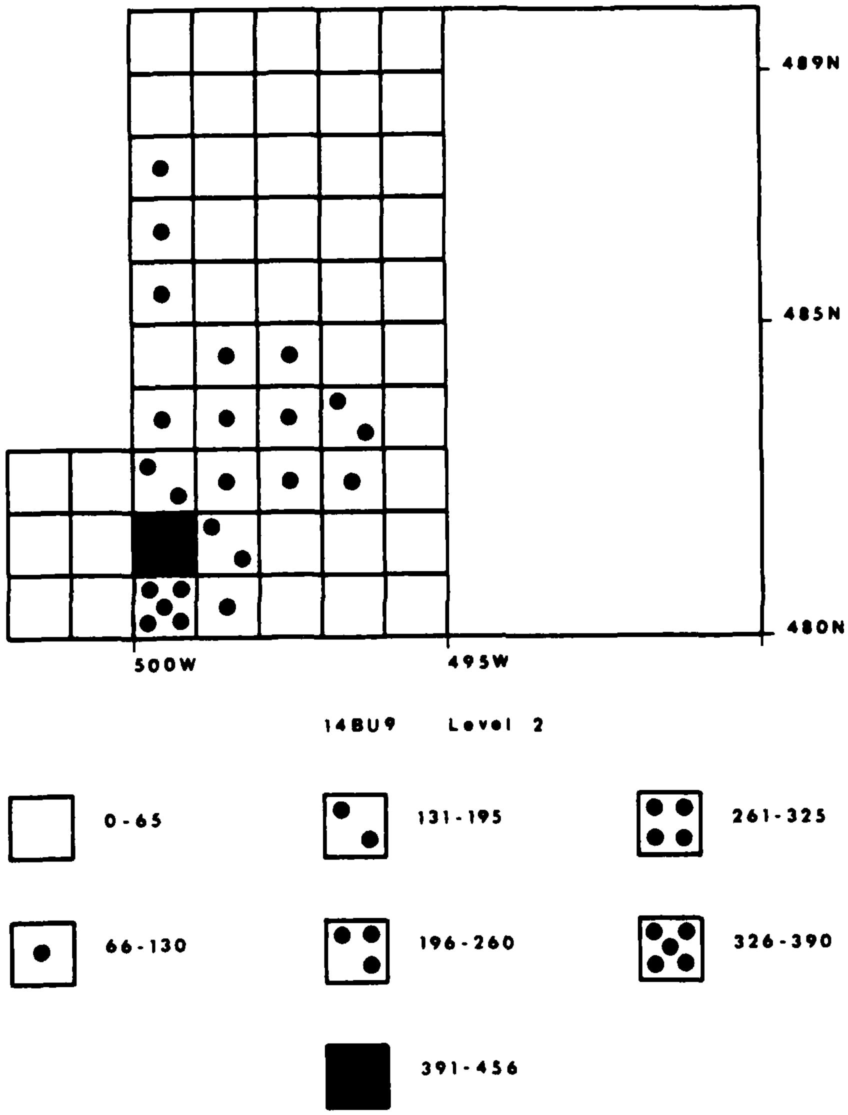

Figure 4.12. Planimetric map of total artifact counts per square in level 2, 14BU9.

number of shading symbols (7 or less) into the greatest artifact count value in any square in the level of interest. Hence, the interval length (65) in Figure 4.12 was found by dividing 456 (the largest value in Table 4.6 for square 481N499W) by 7 (the number of shading symbols desired on the planimetric map).

Returning now to the problem of whether the artifact concentration in the block's southwest quadrant is a function of increased occupation zone thickness or an actual area of high artifact concentration regardless of greater midden thickness, an inspection of Figure 4.12 shows that specimens recovered from level 2 seem, indeed, to be highly concentrated in squares 481N499W and 480N499W. That the artifact concentration is notable even after adjustments are made for greater midden thickness, i.e., that it is not solely a function of increased occupation zone thickness, can be shown by examining the density of artifacts per cubic meter of occupation zone. Table 4.7 contains the artifact counts, cubic meters of midden, and artifact density for the 499W column of meter squares and the 481N row of meter squares. The row and column intersect on square 481N499W, the unit in which the posited artifact concentration is more or less centered, and illustrate

Table 4.7. Artifact density data for unit column 499W and unit row 481N, level 2, 14BU9.

Column 499W				Row 481N			
Unit North	Artifact Count	Cubic Meters	Density	Unit West	Artifact Count	Cubic Meters	Density
489	42	0.02	2100	495	18	0.02	900
488	8	0.03	267	496	41	0.04	1025
487	78	0.04	1950	497	26	0.05	520
486	92	0.05	1840	498	156	0.06	2600
485	76	0.06	1267	499	456	0.08	5700
484	40	0.07	571	500	41	0.08	512
483	74	0.08	925	501	25	0.08	312
482	169	0.08	2112				
481	456	0.08	5700				
480	355	0.08	4437				

the nature of the concentration for both cases of increasing midden thickness (north to south and east to west). Once again, these data are more conveniently assimilated when displayed visually (Fig. 4.13). The density of artifacts per cubic meter of midden is on the vertical axes of the two graphs, excavation units are on the horizontal axes, and units on the horizontal axes have been arranged so that the occupation zone is thickest on the left and thins as one reads to the right. The data and graphs demonstrate that artifact density is not a linear function of midden volume and that there is an artifact concentration located roughly in square 481N499W.

Similar data manipulations revealed that the concentration is detectable in level 3 (Table 4.A1, Appendix 4.A), but not in the plowzone (Table 4.A2, Appendix 4.A) where cultivation and other disturbance processes have homogenized the artifact distribution. Specimen distribution is also homogenized and obscured in level 4 (Table 4.A3, Appendix 4.A) because

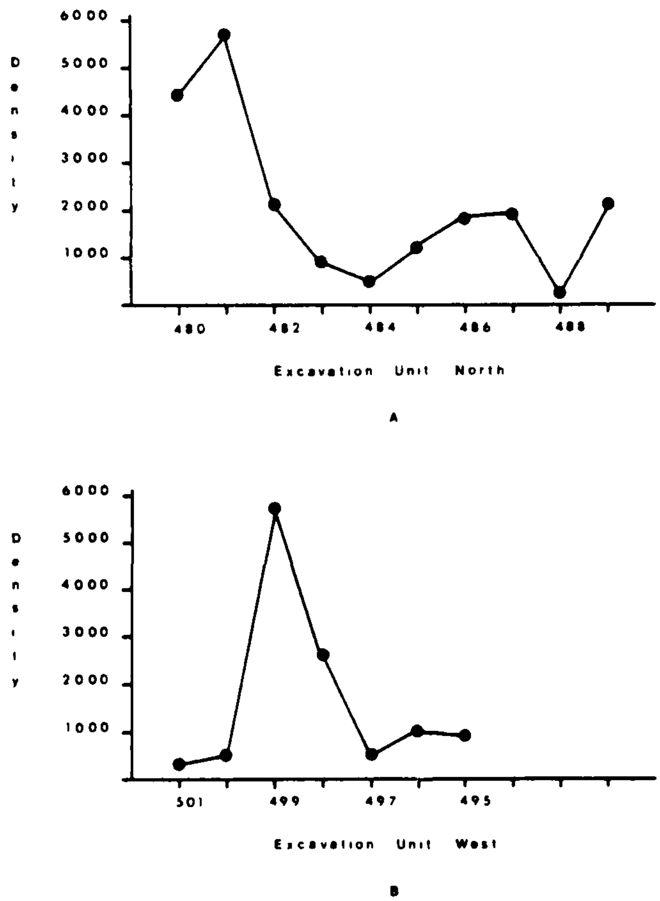

Figure 4.13. Densities of artifacts per cubic meter of occupation zone for (a) unit column 499W and (b) unit row 481N of level 2, 14BU9.

Woodland items intruded, by natural pedoturbation processes, an occupationally void soil horizon (yellowish-brown clay) and were mixed, by the process of excavation, with late Archaic materials in the underlying paleosol. If only the plotted Woodland artifacts are considered, i.e., all specimens located in the level 2 occupation zone and those from level 3 found in the remnant midden stain (shown above to have been part of a Woodland concentration), the relationship between the enigmatic postmold configuration and the artifact concentration can be more clearly delineated. An examination of Figure 4.14 shows that there is an obvious concentration of plotted artifacts which occupies all of unit 481N499W, most of 480N499W, and about half of 482N499W. Furthermore, the concentration lies within the confines of the feature configuration consisting of postmolds 360, 381, 382, and 507, but is adjacent to the first three and well removed from 507. The shape of the concentration as it is outlined by its plotted members in plan view (Fig. 4.14), its proximity to three postmolds along its eastern edge, and the approximate congruity of that eastern edge with the arc defined by the three postmolds, suggest that the concentration and postmolds 360, 381, and 382 are the remains of interrelated and interdependent sets of behavioral events. Specifically, it can be plausibly hypothesized, as above, that postmolds 360, 381, 382, and 507 represent the remains of an anchored framework for a house built on a former ground surface and that the artifact concentration represents the durable remains of activities conducted near the interior eastern wall of the dwelling.

Recall that the occupation zone (or, more precisely, the Vanoss silt loam's A1 horizon) exhibited no physical or stratigraphic evidence pinpointing the precise locations of former ground and/or living surfaces. Assuming that such surfaces were present in the past, they have been obliterated by modern cultivation, pedogenic (soil formation) processes, and, to a lesser extent, pedoturbation processes. Even though they are not mutually exclusive factors, cultivation, pedogenesis, and pedoturbation can be ranked to their ability to erase physical evidence of past living surfaces. Under these circumstances, the only apparent recourse is to investigate feature surfaces of detection for evidence of a possible common surface of origin. To this end, all plotted Woodland artifacts and features have been projected onto the large block's west wall, i.e., the vertical face under the 500W grid line (Fig. 4.15). A west wall projection is preferable to any other such projection (say, for example, the south wall) because it passes through the approximate center of the posited house, it displays the vertical plots over 10 horizontal meters rather than 7, and the north-south profile axis is the dimension of greatest vertical relief of present ground surface (see Fig. 4.11).

Figure 4.15 illustrates several important relationships. First, even though vertical relief of present ground surface in an east-west direction through the excavation exhibits a trend of less than 2 cm., and the intact portion of the occupation zone ranged from 2 to 8 cm. in thickness, the maximum vertical displacement of plotted artifacts is 26 cm. This vertical specimen dispersion exemplifies, on one hand, the efficacy of various pedoturbation processes for moving artifacts around and, on the other hand, the difficulties inherent in demarcating a precise boundary separating the A and B horizons in a Vanoss solum (which characteristically exhibits gradual,

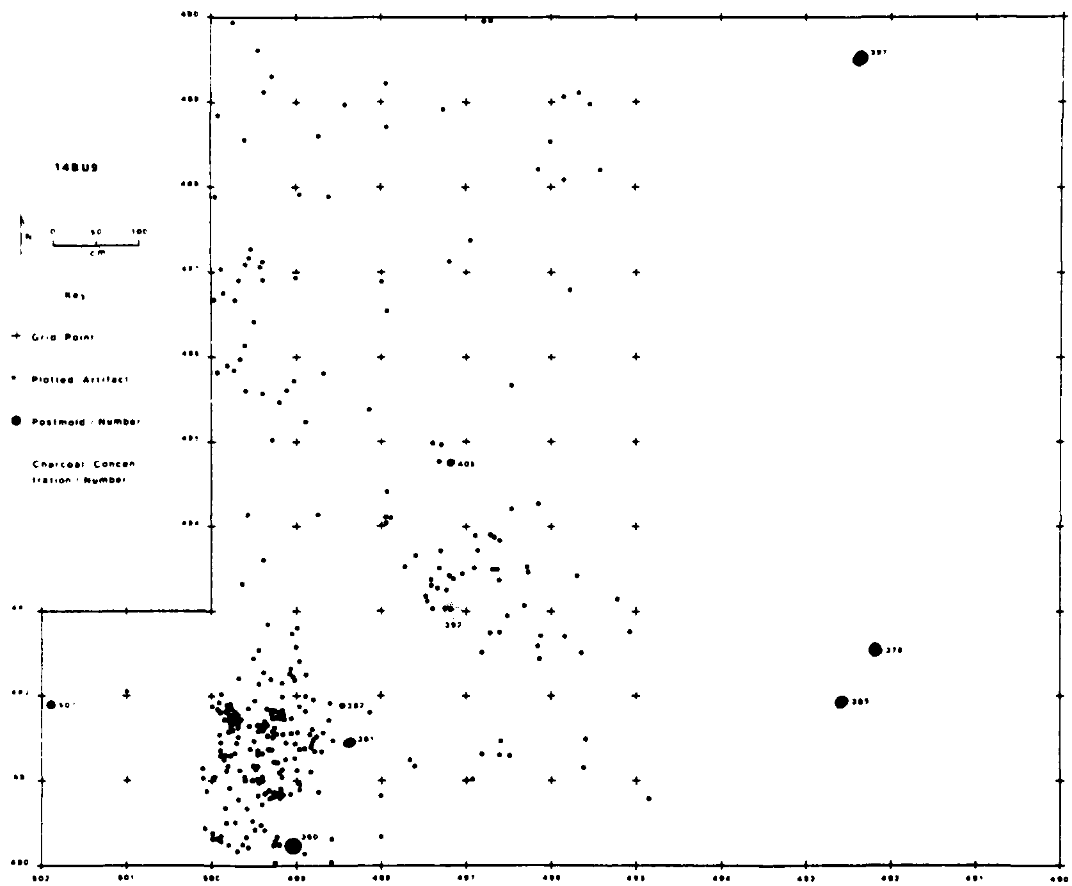

Figure 4.14. Composite plan of Woodland features (n=8) and artifacts (n=303) plotted in levels 2 and 3, 14BU9.

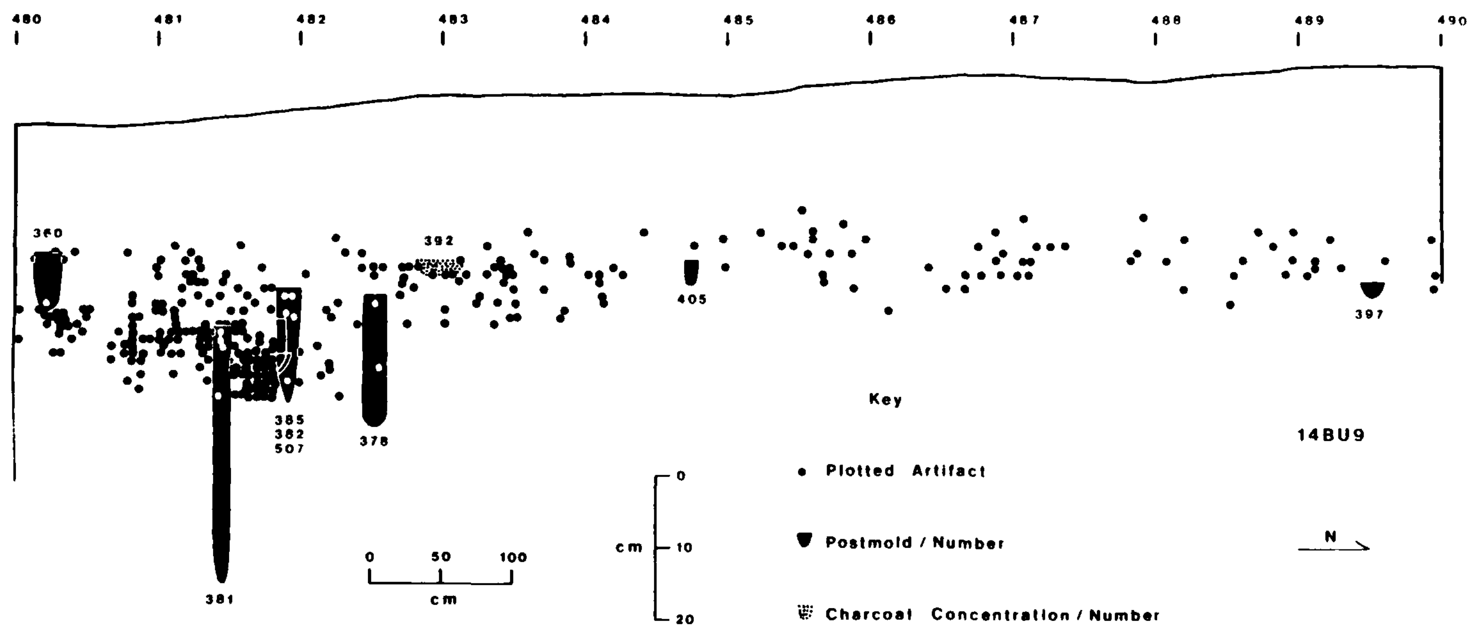

Figure 4.15. West wall projection of Woodland features (n=8) and artifacts (n=303) plotted in levels 2 and 3, 14BU9.

smooth interhorizon transitions; U.S.D.A. 1975). Second, when corrective adjustments are made for microtopographic relief in present ground surface produced by cultivation, the north to south (right to left, Fig. 4.15) surface slope is roughly paralleled by the distribution of plotted artifacts except in units 481N and 480N where there is a pronounced increase in depth of plotted material. This concentration of more deeply buried Woodland debris is the same material which comprises the concentration mapped in units 481N499W and 480N499W (in plan view, Fig. 4.14). Pedoturbation cannot account for the large number of artifacts found at greater than average depths within those two excavated squares. For example, the intact midden in unit 483N was 8 cm. thick (Fig. 4.15), yet pedoturbation displaced artifacts up to a maximum of 11 cm. vertical (i.e., 13 cm. total minus 2 cm. east-west relief); the intact midden in unit 481N was also 8 cm. thick, but maximum vertical dispersion is 19 cm. (i.e., 21 cm. total minus 2 cm. east-west relief). The difference between 19 cm. in 481N and 11 cm. in 483N is certainly not beyond the displacement range of natural disturbance mechanisms, but the large number of more deeply buried specimens in units 480N and 481N does not fit the random dispersal range expected from pedoturbation. Clearly, it is not tenable to posit that pedoturbation was more pronounced in 480N and 481N than in 483N.

Recall that man-made features on the Snyder site exhibited easily detected contrasts in soil color, structure, texture, and compactness. The remnant midden stain observed on the floors of levels 2 and 3 in squares 480N499W and 481N499W had an indistinct boundary in plan (Fig. 4.7) and profile (Fig. 4.8) views. The midden stain associated with the artifact concentration did not exhibit the color, structural, textural, and compactness differentials characteristic of cultural features, so the stain was rejected as evidence for the presence of a man-made pit. If the relatively greater depths of concentrated artifacts in units 480N499W and 481N499W are not accounted for by pedoturbation or by the presence of a cultural feature, then there must have been some sort of natural depression on a former ground surface within which cultural debris was dumped. This natural (i.e. not man-made) depression hypothesis accounts for all of the known facts: (1) greater than average artifact depth (not explainable by pedoturbation), (2) the presence of a stain with an indistinct boundary (not explainable as the remains of a cultural feature), and (3) the configuration of an indistinctly demarcated stain associated with an artifact concentration. The artifacts and other debris dumped into the depression contained organic material (especially bone and charcoal, see below) which decayed and seeped into the soil. Percolating organic matter then stained the soil within and around the specimen concentration so that it closely resembled soil comprising the occupation zone. Hence, upon excavation, the depression appeared as a fuzzily bounded stain in units 480N499W, 481N499W, 481N498W, and 482N499W (Fig. 4.14), and was associated with a concentration of more durable Woodland artifacts.

Figure 4.15 also provides evidence on the possible interrelatedness of postmolds 360, 381, 382, and 507. If all four features were part of an anchored house framework constructed on a former living surface, then their surfaces of origin should approximate the slope and/or relief of that former ground surface. Recall that surfaces of detection for features 381, 382, and 507 were located within the occupation zone, but that feature 360 was truncated

by cultivation and, therefore, must have had a surface of origin higher than the bottom of the plowzone. If the surfaces of detection approximate the surfaces of origin for 381, 382, and 507, then Figure 4.14 shows that either the three features originated from a surface that sloped downward to the south and west or that the relief on that surface was about 5 cm. Neither of the two inferences are incompatible with the anchored framework house built on a former surface hypothesis. However, if postmold 360 is added to the feature group, either the former living surface's relief must have been greater than 15 cm. or that former surface must have sloped north and west. Once again, 15 cm. of former surface relief is not incompatible with the Woodland dwelling hypothesis, particularly if the argument for the presence of a trash filled natural depression is regarded as plausible. If at least 15 cm. of former surface relief is possible (and clearly it is), then the contradictory inferences about former surface slopes extrapolated from feature surfaces of detection/origin are irrelevant. In fact, what little is currently known about the formation of the Vanoss silt loam (on surfaces of the first terraces above floodplains) suggest that the solum and, hence, the cultural midden or A1 horizon at 14BU9, should slope in the same direction as the terrace's surface: downward to the south and west. That this is the case for the Woodland occupation zone is shown by the profiles in Figures 4.11 and 4.15.

The preceding paragraphs have presented the arguments and evidential bases for two intermediate inferences: (1) Woodland artifacts and garbage were dumped into a natural depression located inside the east wall of the posited house; and (2) feature microstratigraphy and former living surface relief and slope are compatible with the Woodland dwelling hypothesis. Notice, however, that the prehistoric presence of an anchored framework house built on an old ground surface has not been demonstrated, nor has any inference been offered about the synchronicity of the artifact concentration vis-a-vis the dwelling. Since solution of the latter problem logically depends on the outcome of the former, a conclusion must be reached concerning the strength of the excavated evidence either for or against the posited house. The anchored framework dwelling hypothesis has already been confronted with information on the plan view configuration of postmolds 360, 381, 382, 507 and their microstratigraphy with respect to each other within the context of possible former living surface slope and relief. In the absence of a detectable house floor, or any other former ground surface, the postmolds' plan configuration and microstratigraphy are consonant with the posited dwelling; those data do not falsify the anchored framework house hypothesis. The only other way to test the proposition with data recovered from the 1978 and 1979 excavations is to examine the spatial distribution of artifacts that may have been physically part of the house: daub and/or burned earth.

There is reasonably sound evidence that Woodland groups living in the El Dorado Lake project area constructed houses by building an anchored framework which was then filled out with a pole, twig and/or grass wattle and, at least partially, finished with a clay plaster (see Adair and Brown, Chapter 5, this volume; Bastian 1969; Fulmer 1977; Leaf 1979). Daub and burned earth are two of the more numerous artifact classes recovered from the recent excavation on 14BU9 (Table 4.5). Burned earth and daub, however, present the

archeologist with an analytical dilemma. When found on a prehistoric site, members of the two sets are taken to signify the former presence of vastly different phenomena. Houses, or some other kind of plastered wattle structure, are equated with daub; whereas burned earth merely indicates some sort of fire, or other sufficient thermal environment, located on or near the ground surface, which could have been man-made or natural. The dilemma arises because burned earth and daub are not mutually disjoint classes; in fact, daub is a particular kind of burned earth, i.e., daub is burned earth which exhibits wattle (grass, twig, and/or pole) impressions. Pragmatically, what this implies is that as each piece of burned earth is examined, if it exhibits wattle impressions then it is identified as daub; otherwise it is identified as burned earth. But even this basic sorting of specimens into one class or the other is complicated because it is possible for daub to break apart in such a manner so as to leave fragments with no wattle impressions at all; and it is possible for mere burned earth to have become impressed by grass, twigs, and/or poles (branches, logs) under the proper, perhaps accidental, prefiring conditions. This identification indeterminancy problem is primarily limited to physically small pieces or small sample sizes.

Even with the above provisos in mind it is difficult to imagine the fortuitous conditions which resulted in a large piece of burned earth with two smoothed, roughly parallel surfaces and an internal cylindrical vacuity (Fig. 4.16a). That the illustrated specimen is a piece of daub can be

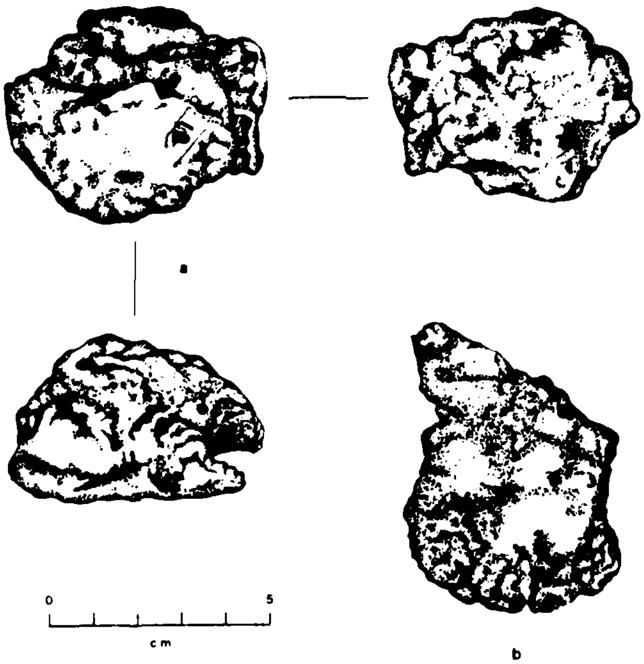

Figure 4.16. Examples of fired earth artifact classes: (a) daub (A5028678-5) and (b) burned earth (A5030578-4), 14BU9.

inferred from the morphological characteristics noted above and the improbability that the other 194 specimens identified as daub are actually pieces of mere burned earth that somehow were indented with plant parts identical to wattle. In other words, the small number of physically large specimens, all of which exhibit various permutations of grass, twig, and pole impressions with occasional smoothed exterior surfaces, demonstrates that most of the artifacts identified as daub are, in fact, daub, i.e., fragments of fired plaster from houses or similar structures. An analogous case can be made for burned earth (Fig. 4.16b). The large sample of burned earth (n=2083) recovered from an occupation zone with other artifact classes associated with the human control of fire (such as charcoal, burned limestone, burned bone, pottery, and hearth-stones) demonstrates that most of the burned earth pieces are a product of prehistoric human behavior rather than natural events (such as prairie fires). The identification indeterminancy problem guarantees that the size of the burned earth sample is inflated by an undetermined number of unrecognizable pieces of daub. For this reason, the spatial distribution of both artifact classes is examined with respect to the dwelling hypothesis.

If postmolds 360, 381, 382, and 507 are the remains of an anchored framework for a house which had partially plastered wattle walls and if the house was destroyed or decayed in place, then the spatial distribution of recovered daub should exhibit a density pattern such that density is highest in and adjacent to the house's enclosed floor area and that density should fall-off as horizontal distance increases from the enclosed floor area. The density pattern implicated by the hypothesis does not have to be adjusted for the interaction of density fall-offs from two or more houses, since there are no data which suggest the former presence of additional houses within the excavation space. An expected spatial distribution for burned earth is somewhat more complicated than is the case for daub. If the hypothesis is true, then an undetermined, but large, amount of burned earth is small fragments of unrecognizable daub. Thus, burned earth should exhibit the same density pattern as daub in and around the house. Mere burned earth can also be expected to show the density fall-off pattern in areas where pottery was fired, hearths were built and used, where hearth cleaning debris was dumped, and so on. Within the area of 14BU9 excavated in 1978 and 1979, there is no evidence for such features as hearths or pottery firing areas, but the possible presence of one or two concentrations of hearth cleaning debris cannot be eliminated.

Daub counts per square in level 2 (Table 4.8) are high in two areas of excavation (Fig. 4.17): (1) in the meter square, 481N499W, which also contains most of the Woodland artifact concentration; and (2) in unit 486N499W. The daub counts are not large in <u>all</u> the units comprising the probable enclosed floor area of the house and adjacent squares (i.e., the 12 sq. m. of area contained within grid coordinates 480N498W, 480N502W, 483N502W, and 483N498W) as implicated by the hypothesis. Daub density data for unit column 499W and unit row 481N (Table 4.9) were examined, for the same reasons offered earlier for total artifact counts, and displayed on graphs which compare observed unit densities with expected density fall-off patterns (Fig. 4.18). Observed daub density per unit does not conform to the anticipated curves, so these data do not support the hypothesis that an anchored framework dwelling which had partially plastered walls was constructed in the southwest corner of the excavation. However, daub densities do fall-off in all four cardinal

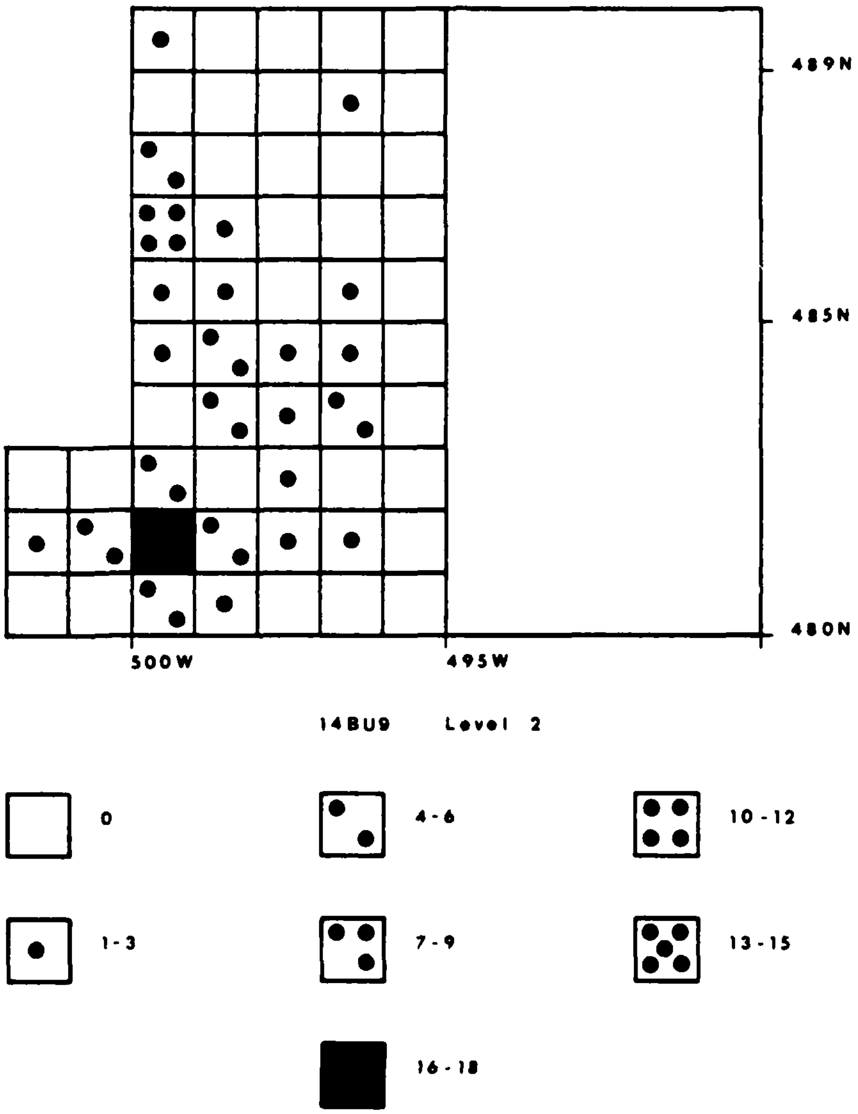

Figure 4.17. Planimetric map of daub counts per square in level 2, 14BU9.

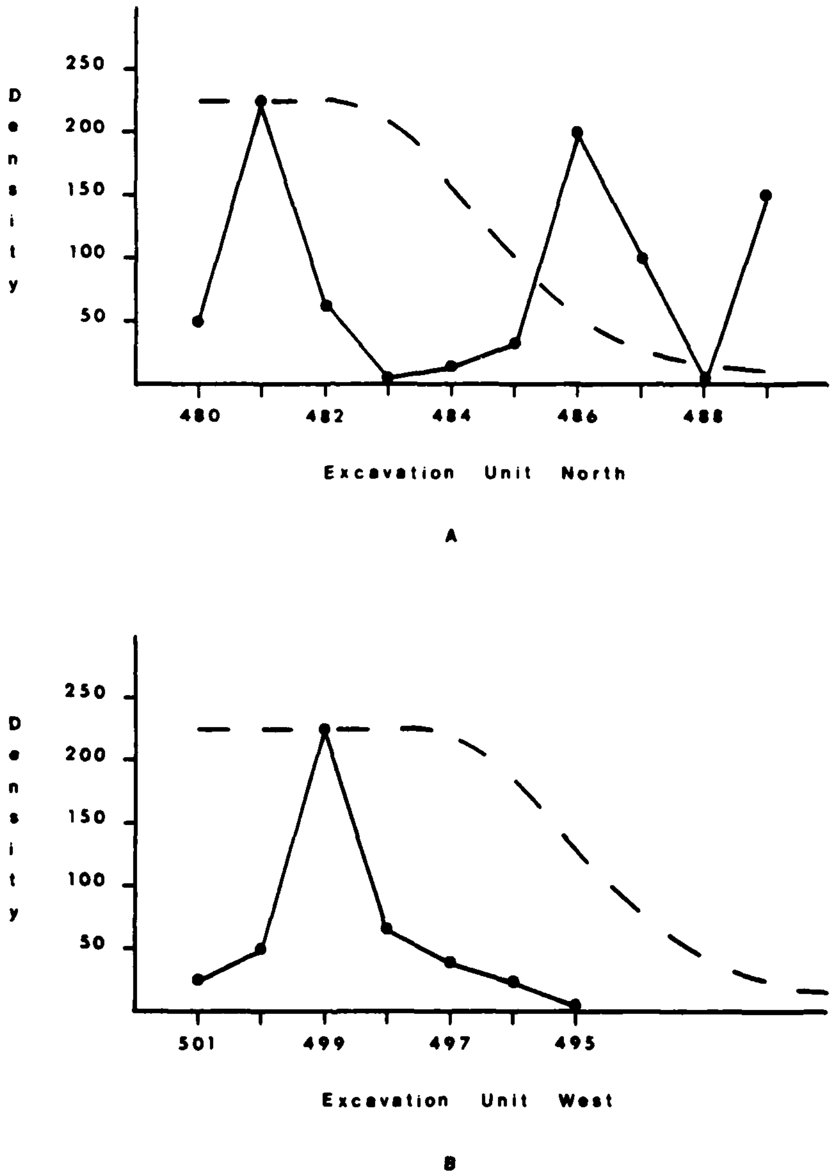

Figure 4.18. Densities of daub per cubic meter of occupation zone for (a) unit column 499W and (b) unit row 481N of level 2, 14BU9. Dashed lines indicate expected fall-off pattern.

Table 4.8. Daub counts per square in level 2, 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	3	0	0	0	0
488N	-	-	0	0	0	1	0
487N	-	-	4	0	0	0	0
486N	-	-	10	2	0	0	0
485N	-	-	2	1	0	1	0
484N	-	-	1	5	3	1	0
483N	-	-	0	6	2	5	0
482N	0	0	5	0	1	0	0
481N	2	4	18	4	2	1	0
480N	0	0	4	1	0	0	0

directions from the Woodland artifact concentration roughly centered in square 481N499W. The second area of high daub count and high daub density in unit 486N499W (Figs. 4.17 and 4.18) also exhibits a density fall-off pattern in at least three cardinal directions (north, south, and east). Total daub counts per square in levels 1 and 3 are greatest in units containing the artifact concentration, are similar to the data examined in detail for level 2, and, therefore, do not support the Woodland house hypothesis (Tables 4.A4 and 4.A5, Appendix 4.A; the single piece of daub retrieved from level 4 was found in 481N499W).

The spatial distribution of burned earth in all four levels shows a pattern that is similar to that discussed for daub. Specimen counts per unit in level 2 (Table 4.10 and Fig. 4.19) are highest in two places: (1) the artifact concentration in unit 481N499W; and (2) unit 483N496W. Both areas of burned earth concentration have density fall-off patterns which radiate in all horizontal directions from their centers. Once again, the expected burned earth counts are not large in all the units comprising the probable enclosed floor area of the house and adjacent units, so these data also do not support the anchored framework dwelling hypothesis. The burned earth data for levels 1, 3, and 4 (Tables 4.A6, 4.A7, and 4.A8, Appendix 4.A) reflect accurately the distribution of burned earth in level 2, especially the locus identified as an area of Woodland artifact concentration. Furthermore, it should be noted that both the daub and burned earth artifact

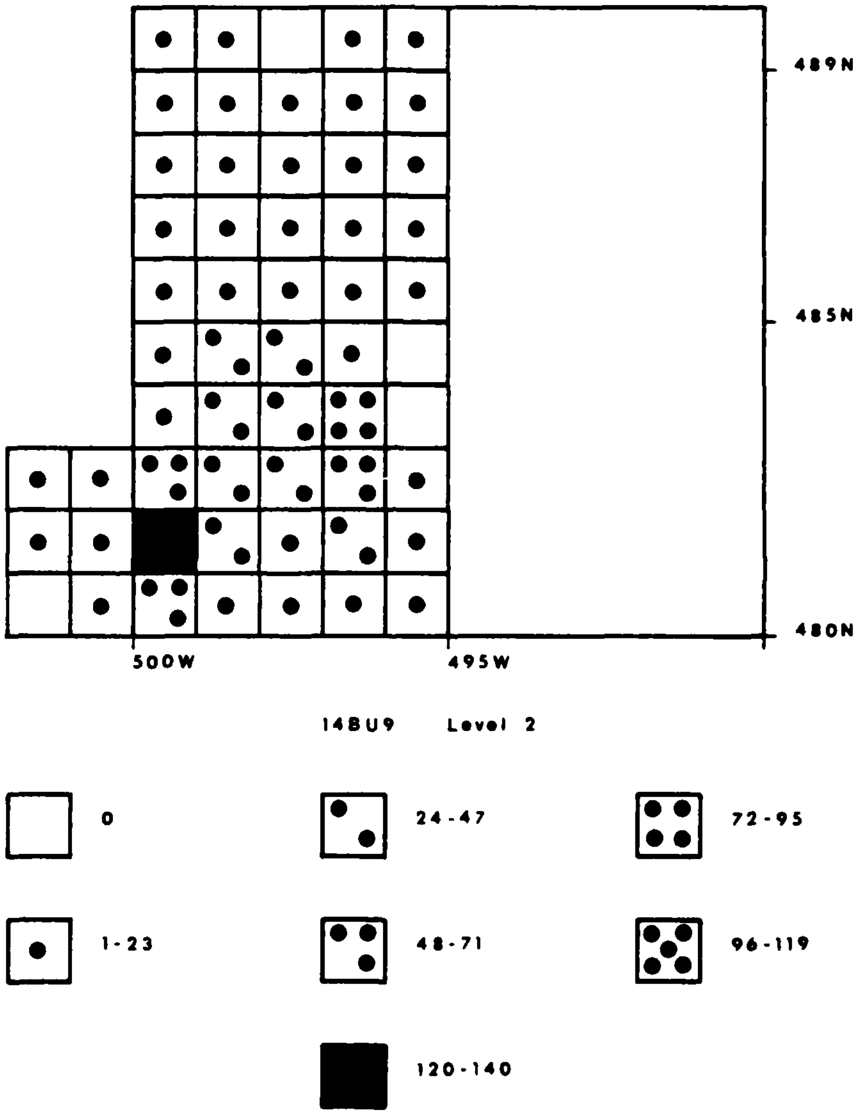

Figure 4.19. Planimetric map of burned earth counts per square in level 2, 14BU9.

Table 4.9. Daub density data for unit column 499W and unit row 481N, level 2, 14BU9.

Column 499W				Row 481N			
Unit North	Artifact Count	Cubic Meters	Density	Unit West	Artifact Count	Cubic Meters	Density
489	3	0.02	150	495	0	0.02	0
488	0	0.03	0	496	1	0.04	25
487	4	0.04	100	497	2	0.05	40
486	10	0.05	200	498	4	0.06	67
485	2	0.06	33	499	18	0.08	225
484	1	0.07	14	500	4	0.08	50
483	0	0.08	0	501	2	0.08	25
482	5	0.08	62				
481	18	0.08	225				
480	4	0.08	50				

classes contributed numerous specimens to the artifact concentration centered in unit 418N499W. If the planimetric maps for daub, burned earth, and all artifacts are compared, a second possible artifact concentration seems to be located in square 483N496W. Total artifact counts (Fig. 4.12) are high in 483N496W, at least relative to all other units in level 2 that do not also include the concentration within the posited house. Burned earth counts (Fig. 4.19) appear to peak in this second area; daub counts are also high (Fig. 4.17), but are higher elsewhere so the evidence is not quite as convincing. The distribution of plotted artifacts in Figures 4.14 and 4.15 seem to lend support to the existence of a second artifact concentration centered in 483N496W. The high daub count in 486N499W is not visually correlated with other artifact class concentrations.

That the spatial distribution and observed density fall-off patterns of daub and burned earth did not support the anchored framework house hypothesis is not too surprising, because the mechanism of house destruction is relevant for formulating test implications about the dispersion of daub and burned earth from the hypothesis. For, if the posited house had been abandoned and left to decay in place, the unfired plaster would have disintegrated

Table 4.10. Burned earth counts per square in level 2, 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	11	4	0	1	3
488N	-	-	5	1	1	8	10
487N	-	-	23	7	5	4	1
486N	-	-	18	10	4	7	4
485N	-	-	22	7	1	9	2
484N	-	-	4	28	42	12	0
483N	-	-	19	30	25	79	0
482N	1	3	68	30	28	63	10
481N	9	9	140	38	2	24	5
480N	0	7	68	21	9	7	2

and become an indistinguishable part of the modern surface soil. Unfired plaster could not have survived centuries of weathering and, therefore, could not have been recovered in the excavation. In this situation, information and observations which could lend support to the hypothesis would include the postmolds dug for the anchored portion of the framework and, possibly, some sort of compacted enclosed floor area. No compacted floor was detected, there is no artifact distribution relatable to an area where debris was trampled into a house floor, and, aside from the four postmolds, there were no features (hearth, storage pit, roasting pit, etc.) within or around the posited structure. Thus, given the near total absence of positive data for the former presence of an anchored framework structure which decayed in place, the interrelatedness of postmolds 360, 381, 382, and 507 is neither demonstrated nor rejected conclusively. If the posited house had burned in place, however, the results would not be ambiguous, because much of the plaster and, perhaps, the floor would have been thermally hardened. In this situation, the distribution of daub and burned earth would have probably conformed to the expected density fall-off patterns, a hardened house floor with charred artifacts may have been delineated, and the postmolds or their fills would certainly have been modified in some detectable manner. Clearly, if there was an anchored framework house with partially plastered walls in the southwest corner of the excavation, it did not burn in place; in fact, the conclusion can be generalized to assert that there is no evidence for

the former in place burning of any kind of house or structure in that particular locus.

If no Woodland structure was destroyed by a prehistoric fire within the limits of the block excavation, and if only fire hardened daub and burned earth survived the intervening centuries of physical and chemical weathering, then the daub and burned earth excavated from the artifact concentration within the area of the posited house could not have been part of that house. It seems unlikely that prehistoric man would have taken portions of such a structure somewhere else, burned them, and then returned the consumed or thermally altered debris to the same spot for disposal. It seems more probable that prehistoric man accumulated trash elsewhere on 14BU9, some of which was burned or fire hardened, and discarded it on and around what has subsequently been designated square 481N499W. Since there is insufficient evidence for in situ burning within and around unit 481N499W, pieces of daub and burned earth found in the artifact concentration must have been exposed to sufficient heat somewhere else, transported to and finally dumped into the depression to form the excavated concentration. Thus, there is no demonstrable connection between the feature configuration and the artifact concentration. The trash heap could have been deposited before, during, or after posts were standing in the four postmolds. Furthermore, if the synchronicity of the postmold configuration and the artifact concentration cannot be demonstrated, then, obviously, the artifact concentration cannot be cited as evidence to support the proposal that the four postmolds were part of the same structure, since their synchronicity is also not demonstrated.

A conclusion regarding the validity of the anchored framework house proposal can be inferred from a summary of results established in previous paragraphs: (1) there is an artifact concentration approximately centered on square 481N499W that overlaps some adjacent units; (2) the concentration was located within the confines of a feature configuration comprised of four postmolds; (3) the artifact concentration was also located in a natural depression; (4) no former ground and/or living surface was observed or analytically isolated; (5) no former house floor was observed or analytically isolated; (6) the spatial distribution of daub and burned earth does not support the anchored framework house hypothesis; (7) the synchronicity of artifact concentration with the postmold configuration could not be demonstrated; and (8) the synchronicity of the postmolds could also not be demonstrated. Now, on one hand, the eight recorded postmolds show that anchored house frameworks are possible on 14BU9. The numerous pieces of recovered daub signify that some kind of wattled structure was plastered; evidence from other Woodland sites in the general El Dorado area indicates that plastered structures were houses. But, on the other hand, there is no readily apparent way to connect the Snyder site daub collection with the feature configuration or to connect any individual postmold with any other postmold. Surely, the analytic desideratum which distinguishes a fortuitous postmold configuration from an identical configuration produced by a single house construction event is that the synchronicity of the house's postmolds is demonstrable with independent data. Stated in other terms, to show that the four postmolds (360, 381, 382, and 507) were structural elements of a house requires observations which support the thesis that features participated simultaneously in anchoring a framework and which are not disguised restatements that dwelling construction results in such configurations.

The fortuitous versus framework anchor configuration problem was examined by searching for an observable or analytically isolatable house floor and by studying the spatial distribution of burned earth and daub. These data sets did not support the assertion that the four postmolds participated simultaneously in anchoring a framework (and, therefore, not a house framework); there do not seem to be any other data sets, available from the 14BU9 block, relevant to the problem. Hence, on the basis of present evidence, the postmold configuration was not part of an anchored framework house and must be the result of unrelated post erecting events. How any of the posts standing in the eight recorded postmolds were used by Woodland Indians at 14BU9 is not known. If there was no house in the southwest corner of the excavation, then the artifact concentration located in the same area does not constitute debris discarded from activities conducted inside the house; in fact, no connection can be shown relating the concentration to any of the postmolds.

Recall that the Woodland occupation zone (Vanoss A horizon) was truncated by cultivation and that pedoturbation processes were responsible for specimen displacements; these two sets of disturbance processes had the effect of vertically and horizontally dispersing prehistoric artifacts. The presence of a developed (zoned) soil and numerous easily delimited postmolds within the excavation space demonstrate that Woodland artifact concentrations were produced by human activity and not by noncultural geomorphic processes. The above analyses of artifact distributions established the presence of two such artifact concentrations within the intact Woodland occupation zone: (1) the first is centered on unit 481N499W and occurs in portions of 480N499W, 481N498W, and 482N499W; and (2) the second occurs in units 482N496W 483N496W, and 483N497W. Both concentrations are relatively small areas of excavation space which contained: (1) markedly higher artifact frequencies than comparable adjacent areas (see Table 4.6 and Figs. 4.12, 4.14), and (2) numerous pieces of daub and burned earth (Tables 4.8, 4.10). The complete lack of evidence for in situ burning in both areas demonstrates that neither artifact concentration is the remains of either a house or a hearth.

Two plausible interpretations concerning the nature of the artifact concentrations were tentatively offered in various previous discussions. One possibility is that one or both of the Woodland concentrations are the remains of trash disposal; the second possibility is that one or both concentrations are the product of some other more specific activity conducted at those loci (e.g., chipped stone tool manufacture, animal butchering, food preparation, and so on). These two general alternatives can be set out as explicit hypotheses and tested with distributional data from various relevant artifact classes. If one or both artifact concentrations resulted from trash dumping, then the concentrations should include specimens from all of the more numerous artifact classes recovered from the excavation (Table 4.5); chipped stone, burned earth, limestone, bone, daub, rotten chert, and charcoal. General kinds of prehistoric Woodland activities which generated large quantities of garbage were the manufacture of chipped stone tools (lithic debitage), small game butchering (chipped stone tools, bone), plant food preparation (charred seeds, rotten chert) and food cooking (limestone, rotten chert, charcoal, pottery). If one or both artifact concentrations resulted from spatial segregation of different specific Woodland activites, then the

concentrations should contain restricted sets of task associated artifact classes. The precise composition of an artifact concentration produced *in situ* by a specific Woodland task depends on what particular activity was conducted, but such a concentration would not include specimens from all of the most numerous artifact classes retrieved from the site. No purpose is served in the present problem context by requiring precise enumeration of more finely discriminated debris classes generated by all possible specific Woodland tasks enacted on the Snyder site. Since ample evidence has already been presented which demonstrates that both artifact concentrations contained substantial amounts of burned earth (Table 4.10, Fig. 4.19), daub (Table 4.8, Fig. 4.17), and physically large plotted items (Figs. 4.14, 4.15), all of which have partially supported one hypothesis over the other, it seems both efficient and sufficient to test for the formation of the two artifact concentrations by either garbage dumping or not.

The limestone, fauna, and charcoal data (presented as mass per square rather than item counts because thermoclastic breakage, acid decomposition, and other degradative processes are known to have transformed large pieces into numerous smaller pieces and to have completely decomposed the smallest pieces) all exhibit high values in units containing portions of the two artifact concentrations. In general, most of the limestones (Table 4.11) have pink or reddish tinted outer surfaces produced by thermal alteration; limestones were probably used as hearthstones and/or as radiant heat sources in roasting pits.

Table 4.11. Limestone mass per square in level 2 (tenths of gram), 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	27	1	0	0	0
488N	-	-	0	18	6	25	25
487N	-	-	53	34	45	0	0
486N	-	-	145	19	355	0	0
485N	-	-	61	28	0	114	0
484N	-	-	35	91	107	3	0
483N	-	-	222	89	659	169	100
482N	0	20	1016	137	8	286	81
481N	0	0	875	309	35	0	0
480N	0	5	6930	725	89	0	4

Table 4.12. Fauna mass per square in level 2 (tenths of gram), 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	4	0	0	0	4
488N	-	-	0	0	6	140	0
487N	-	-	13	1	3	0	0
486N	-	-	22	1	7	0	0
485N	-	-	9	8	0	0	0
484N	-	-	1	9	16	5	0
483N	-	-	11	5	12	0	33
482N	5	1	12	7	10	7	5
481N	6	35	148	126	3	1	2
480N	0	9	131	3	0	2	0

Archeofaunal elements (Table 4.12) are fragmentary and poorly preserved unless charred, calcined, or a recent intrusion. Bone and tooth fragments which have exfoliated, powdery, or acid etched surfaces or which are charred or calcined provide evidence that the pronghorn (Antilocapra americana), rabbit (Sylvilagus sp.) and deer (Odocoileus sp.) were used as food items by Woodland Indians at the Snyder site. Bones and teeth which did not have exfoliated, powdery, or acid etched surfaces and which were not charred or calcined provide evidence that the vole (microtine), mole (Scalopus aquaticus), gopher (Geomys sp.) and turtle (Terrepene ornata) were not food items. All animals in this second group prefer habitats or food sources extant in the site area and are burrowers; they are not part of the culturally procured subsistence fauna, but are intrusives.

The archeoflora (Table 4.13) is also very poorly preserved; walnuts (Juglans nigra) are the only demonstrable food item (see Root, Ch. 5, this volume). A dense cluster of small charcoal pieces (feature 392 in Figs. 4.14, 4.15) was observed to be a component of the larger more dispersed artifact concentration in units 483N497W, 483N496W, and 482N496W. The charcoal in feature 392 and immediate environs was separated from its soil matrix by water flotation and submitted for radiocarbon assay; the 43 gm. sample (UGa-2561) returned a date of 520±55 B.P. or A.D. 1430. The radiocarbon date is much too late and is not accepted. The current pattern of acceptable radiocarbon dates associated with Late Woodland ceramics and projectile point

Table 4.13. Charcoal mass per square in level 2 (tenths of gram), 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	0	0	0	0	0
488N	-	-	0	0	0	0	0
487N	-	-	3	0	0	0	0
486N	-	-	1	0	0	0	0
485N	-	-	0	0	0	0	0
484N	-	-	5	0	2	2	0
483N	-	-	0	0	0	3	0
482N	0	0	0	0	35	1	0
481N	0	0	40	0	0	0	1
480N	0	0	7	0	0	0	0

styles in the El Dorado Lake locality implies that the Butler phase Woodland component on the Snyder site should date somewhere between A.D. 800-1000. The submitted charcoal sample must have been contaminated, probably by burned crop stubble falling down desiccation cracks (see Root, Ch. 5, this volume, for elaboration).

Chipped stone counts per unit in level 2 also exhibit high values in squares containing portions of the two Woodland artifact concentrations (Table 4.14). A large proportion of chipped stone recovered from the concentration centered in square 481N499W exhibited extensive thermal damage. Thus, distributional data from all of the more numerous artifact classes clearly demonstrate that the two Woodland artifact concentrations resulted from an accumulation of deposited trash; both concentrations have the high counts of limestone, bone, charcoal, and chipped stone, in addition to daub and burned earth, implicated by the trash disposal hypothesis. The presence of thermally damaged chipped stone, burned earth, charcoal, and charred bone in the concentrations demonstrates that hearth cleaning debris is a major source of dumped trash. Alternatively, the occurrence of daub and unburned chipped stone, limestone, and bone demonstrates that garbage generated by other activities was also accumulated and deposited in the area. These inferences are supported by the distribution of chipped stone tools in level 2 (Table 4.15); the data show high tool counts in the concentration centered

Table 4.14. Chipped stone counts per square in level 2, 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	24	17	11	13	14
488N	-	-	3	22	22	9	14
487N	-	-	41	25	14	12	6
486N	-	-	44	27	15	6	4
485N	-	-	38	20	10	5	1
484N	-	-	19	53	51	18	2
483N	-	-	41	25	41	57	11
482N	3	7	65	53	28	42	14
481N	6	13	147	76	16	15	8
480N	2	11	185	55	9	11	6

in unit 481N499W. The tool counts include all complete or fragmentary retouched pieces and all utilized pieces that are not retouched. Most of the chipped stone tools are broken; many in the concentration centered on unit 481N499W are also thermally damaged. Thus broken and/or otherwise unwanted tools were discarded along with other kinds of trash. Distributional data on limestone, fauna, charcoal, chipped stone, and chipped stone tools from the other levels in the excavation space support the trash disposal hypothesis (Tables 4.A9-4.A21, Appendix 4.A).

Conclusions

Phase II work at the Snyder site (14BU9) demonstrated that even though most of the Late Woodland deposit had been disturbed by modern cultivation, there are intact remnants of occupation zone which occur as thin lenticular lenses. Former Woodland occupation surfaces are confined to the Vanoss silt loam's A horizon. The Vanoss surface soil was formed in sediments deposited on an older surface soil; this buried paleosol contains the Late Archaic cultural deposits.

An excavated 10 m. block retrieved 11,570 artifacts, and recorded eight postmolds and two artifact concentrations. How any of the posts standing in

Table 4.15. Chipped stone tool counts per square in level 2, 14BU9.

	501W	500W	499W	498W	497W	496W	495W
489N	-	-	2	0	1	0	0
488N	-	-	1	2	1	0	0
487N	-	-	0	2	0	0	0
486N	-	-	1	0	0	0	0
485N	-	-	0	0	0	1	0
484N	-	-	1	1	1	0	0
483N	-	-	1	0	1	0	0
482N	2	0	1	0	0	0	0
481N	0	0	5	3	2	0	0
480N	0	1	5	1	0	0	0

the eight postmolds were used by Late Woodland Indians at Snyder is not known. The large sample of recovered daub demonstrates that some kind of wattled structure was built and plastered with clay; however, no structure was actually excavated. A study of the distribution of various artifact classes within the excavation space demonstrated the presence of two artifact concentrations which had resulted from an accumulation of deposited trash. Hearth cleaning debris was a major source of dumped trash, but garbage generated by other activities was also collected and deposited in the same areas.

Finally, from the presence of postmolds, the probable former presence of plastered wattle buildings, and the demonstrated trash collection and disposal behaviors, it can be weakly inferred that Late Woodland occupation of the Snyder site area was not by a transient group and not a short-term event. Transient groups using a base camp area for a few days or weeks generally are not expected to build permanent structures or to expend great effort to collect and dispose of garbage. The Woodland deposit's areal extent in conjunction with the evidence and inferences discussed above lead to the speculation that the Snyder site may have been the location of a Late Woodland hamlet or small village which was possibly occupied for more than one generation. If these interpretations are tenable and if the Snyder site is representative of Late Woodland hamlets in the upper Walnut River

Valley, then it must be obvious that 10 m. block excavations are too small and cannot adequately sample such sites.

Acknowledgements

I gratefully acknowledge the financial support provided by the Tulsa District, Corps of Engineers, and the facilities and equipment provided by the Museum of Anthropology, University of Kansas. Thanks are extended to the field crew: John Eads, Cindy Murphy, Jerry Murphy, Brenda Owens Becky Haight; Matt Root and Chérie Haury were able field and laboratory assistants. Special thanks goes to Dr. Alfred E. Johnson, Director of the Museum of Anthropology, who served as principal investigator on the project. Sincere appreciation is expressed to my wife, Annie, and son, Richard, for their patience.

Some of the analytical strategies used in this chapter were developed during a seminar on archeological spatial analysis offered by Dr. Anta Montet-White at Kansas University in 1979.

APPENDIX 4.A

Supplementary Tables of Data

Table 4.A1. Total artifact counts per square in level 3, 14BU9.

	501W	500W	499W	498W
482N	2	6	111	25
481N	2	12	605	76
480N	1	6	350	29

Table 4.A2. Total artifact counts per square in level 1, 14BU9.

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	40	47	40	76	53	46	64	43	32	27
488N	55	58	23	84	51	34	50	40	45	51
487N	62	68	49	91	96	64	61	40	49	65
486N	60	65	36	105	85	89	76	76	71	79
485N	78	98	57	81	62	60	83	89	52	85
484N	21	92	59	49	39	68	51	66	51	86
483N	141	67	85	72	53	64	64	83	48	60
482N	130	81	129	49	62	65	45	42	60	76
481N	133	88	75	62	83	79	49	66	72	83
480N	128	150	68	60	70	64	55	53	79	61

Table 4.A3. Total artifact counts per square in level 4, 14BU9.

	501W	500W	499W	498W
482N	11	14	24	55
481N	25	24	87	9
480N	14	5	13	11

Table 4.A4. Daub counts per square in level 1, 14BU9.

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	0	1	0	0	0	0	0	0	0	0
488N	0	4	0	0	0	0	0	0	0	0
487N	0	0	0	2	0	0	0	0	0	0
486N	0	0	0	1	0	0	0	0	0	1
485N	0	0	0	0	0	0	0	0	0	0
484N	0	2	1	0	0	0	0	0	2	0
483N	2	2	0	0	0	0	0	0	0	0
482N	1	0	0	0	0	0	0	0	0	0
481N	0	1	0	0	0	0	0	0	0	0
480N	3	6	0	0	1	0	0	0	2	0

Table 4.A5. Daub counts per square in level 3, 14BU9.

	501W	500W	499W	498W
482N	0	0	0	0
481N	0	1	33	7
480N	0	1	30	0

Table 4.A6. Burned earth counts per square in level 1, 14BU9.

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	10	3	6	13	6	6	6	7	0	1
488N	4	8	5	4	4	2	4	9	1	3
487N	6	10	5	13	14	5	13	0	1	12
486N	12	3	5	12	14	11	6	5	6	10
485N	17	8	7	9	24	7	8	5	3	4
484N	5	20	8	2	1	10	1	4	5	6
483N	22	6	14	4	4	4	2	3	5	2
482N	29	9	21	4	1	6	2	6	5	3
481N	15	7	6	4	11	2	2	2	3	3
480N	18	19	11	4	2	0	5	5	29	4

Table 4.A7. Burned earth counts per square in level 3, 14BU9.

	501W	500W	499W	498W
482N	0	1	25	7
481N	1	1	212	14
480N	0	0	70	8

Table 4.A8. Burned earth counts per square in level 4, 14BU9.

	501W	500W	499W	498W
482N	0	5	9	15
481N	1	7	26	1
480N	1	0	1	4

Table 4.A9. Limestone mass per square in level 1, 14BU9 (tenths of grams).

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	81	295	12	114	54	1705	41	65	394	168
488N	72	38	122	279	388	555	42	273	133	96
487N	419	143	45	330	482	112	206	428	147	176
486N	11	319	87	1080	153	287	300	337	319	180
485N	47	82	1864	207	277	290	27	4600	78	477
484N	8	759	109	295	886	251	365	525	56	255
483N	1246	442	326	319	273	854	453	81	160	269
482N	100	4137	694	550	270	396	250	175	110	300
481N	503	972	750	294	1299	216	416	128	290	328
480N	312	548	1045	444	212	786	193	440	32	885

Table 4.A10. Limestone mass per square in level 3, 14BU9 (tenths of grams).

	501W	500W	499W	498W
482N	0	0	1260	249
481N	0	764	4127	293
480N	0	72	586	0

Table 4.A11. Limestone mass per square in level 4, 14BU9 (tenths of gram).

	501W	500W	499W	498W
482N	0	0	98	710
481N	0	0	25	0
480N	0	0	0	0

Table 4.A12. Fauna mass per square in level 1, 14BU9 (tenths of gram).

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	5	17	5	0	1	0	5	1	0	0
488N	2	5	13	15	1	0	0	5	1	0
487N	6	1	2	0	6	1	0	3	1	1
486N	1	0	0	3	1	2	3	0	0	0
485N	6	1	4	1	5	0	2	2	0	6
484N	1	1	0	0	14	0	8	2	1	1
483N	2	0	19	3	0	4	1	1	0	0
482N	5	1	6	0	2	2	0	0	4	7
481N	5	10	3	2	9	2	0	1	12	3
480N	4	10	3	0	1	17	0	1	2	0

Table 4.A13. Fauna mass per square in level 3, 14BU9 (tenths of gram).

	501W	500W	499W	498W
482N	0	5	12	9
481N	0	8	369	25
480N	6	0	102	4

Table 4.A14. Fauna mass per square in level 4, 14BU9 (tenths of gram).

	501W	500W	499W	498W
482N	0	6	10	6
481N	18	7	30	4
480N	16	0	5	6

Table 4.A15. Charcoal mass per square in level 3, 14BU9 (tenths of gram).

	501W	500W	499W	498W
482N	0	0	6	0
481N	0	0	44	0
480N	0	8	3	0

Table 4.A16. Charcoal mass per square in level 4, 14BU9 (tenths of gram).

	501W	500W	499W	498W
482N	0	0	0	11
481N	4	4	0	4
480N	0	0	20	0

Table 4.A17. Chipped stone counts per square in level 1, 14BU9.

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	23	27	24	52	34	24	46	30	17	15
488N	40	41	14	56	29	12	39	23	31	34
487N	43	46	32	48	59	44	38	29	33	34
486N	40	44	20	58	56	55	53	46	41	48
485N	43	74	31	58	25	32	58	63	42	58
484N	11	60	40	34	19	37	27	35	33	58
483N	69	36	55	44	34	29	48	53	27	44
482N	66	50	68	32	34	43	29	22	45	43
481N	77	49	38	36	38	60	38	49	46	56
480N	70	83	33	33	46	26	40	29	37	36

Table 4.A18. Chipped stone counts per square in level 3, 14BU9.

	501W	500W	499W	498W
482N	2	1	15	6
481N	1	2	116	33
480N	0	1	194	19

Table 4.A19. Chipped stone counts per square in level 4, 14BU9.

	501W	500W	499W	498W
482N	10	5	4	6
481N	11	10	15	4
480N	9	5	9	5

Table 4.A20. Chipped stone tool counts per square in level 1, 14BU9.

	499W	498W	497W	496W	495W	494W	493W	492W	491W	490W
489N	0	1	0	0	0	0	1	0	0	0
488N	0	0	0	1	0	0	0	2	1	0
487N	1	1	1	2	0	0	1	0	0	0
486N	1	0	0	2	1	0	1	1	0	2
485N	0	1	3	1	0	2	1	0	1	2
484N	0	0	0	2	0	0	0	1	0	0
483N	2	1	0	1	0	2	1	0	0	0
482N	2	2	1	0	2	2	1	0	0	1
481N	0	0	1	0	1	2	1	1	1	1
480N	0	3	1	0	1	0	0	1	1	1

Table 4.A21. Chipped stone tool counts per square in level 3, 14BU9.

	501W	500W	499W	498W
482N	0	0	0	0
481N	1	0	2	0
480N	0	0	6	1

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CHAPTER 5

THE TWO DEER SITE (14BU55): A PLAINS WOODLAND - PLAINS VILLAGE TRANSITION

Mary J. Adair and Marie E. Brown

Abstract

The Two Deer site, 14BU55, has been the focus of investigations for limited testing in 1975 and extensive data recovery in 1978 and 1979. This chapter provides an account of the latter two seasons of work at this site. Three problem areas governed the extent of fieldwork and analyses of recovered material culture. These are: (1) the identification of Two Deer as a Plains Woodland-Plains Village transition site; (2) the documentation of the introduction of agriculture into the project area and the acceptance of these foods by the prehistoric inhabitants of Two Deer; and (3) the delineation of spatial patterning of the material culture within House 1 at Two Deer. This report centers on the first problem by addressing the validity of defining Two Deer as a transitory Plains Woodland-Plains Village occupation. This is accomplished by presenting and discussing the complete artifact inventory, the structures and associated features, the floral and faunal remains, and the chronology. In addition, these aspects are compared with both Plains Woodland and Plains Village cultural phases in eastern Kansas and northeastern Oklahoma.

Introduction

Two Deer is a Plains Woodland-Plains Village tradition occupation located within the flood-pool boundaries of the El Dorado Lake, south-central Kansas. Based upon results of initial tests conducted in 1975 (Fulmer 1977), the site was recommended for extensive data recovery. Results of the earlier investigations indicated this site's potential value in providing information concerning habitation structures, early agriculture, and the local continuity between Plains Woodland and Plains Village traditions. No other site within the project boundaries was known to share this potential with Two Deer, indicating that the kinds of information that the Two Deer site could provide would not only sufficiently satisfy the goals and objectives of the research design for the El Dorado Lake project (Leaf 1976:83-5) but would also contribute towards the general understanding of culture chronology in south-central and south-eastern Kansas.

This chapter provides an account of the 1978 and 1979 season's investigations at the Two Deer site as governed by the general problems and research goals of the project's research design. In addition, these investigations focused on specific areas of interest which were primarily site-related. These will be discussed in the research design.

Background

The Two Deer site is located on the south (left) bank of Bemis Creek, approximately one km. from its confluence with Lake Bluestem (Fig. 5.1). The site was first recorded as 14BU55E and was surveyed and tested in 1975 (Fulmer 1977). The designation 14BU55E was applied, rather than a new site number, since the artifact scatter appeared to be distinct from Fulmer's major area (14BU55), approximately 150 m. to the west. The exact limitations of the scatter of cultural material from the two localities were never determined. However, surface material from 14BU55 indicated an Archaic component, while that from 14BU55E suggested a Woodland component. The obvious temporal difference and the partial spatial separation between the two components prompted the formal separation of these two components by designating them as separate sites with unique site numbers. Thus, 14BU55E was shortened to 14BU55, and the Archaic component, originally referred to by this number, was designated 14BU92 (Root 1978:27) (Fig. 5.2).

During the 1978 field season, two subareas of 14BU55 were recognized. The larger subarea A (Fig. 5.2) covers about 35 acres or 14 ha. While several grab bag surface collections were conducted in this subarea in 1978 and 1979, the amount of material recovered was limited. The majority of the surface material from this subarea was donated to the Museum of Anthropology by Ethne Barnes, a local El Dorado resident. Barnes, who holds an MA degree in Anthropology from Wichita State University, first discovered the site in the early 1970's and had surface collected from the site for several years prior to testing by the Museum. Subarea B, approximately 75 m. southwest of subarea A, at one time exhibited tools diagnostic of a Plains Village component, according to Barnes. Diagnostic tools were not fould in this subarea and subsurface excavations were not conducted by the Museum. This area was not given a unique site number. All excavations conducted at the Two Deer site have been within subarea A.

A one week test within subarea A of the Two Deer site was conducted in 1975 with the use of a road grader. A trench approximately two m. by ten m. and aligned slightly northeast to southwest, was cut with a grader to a depth of approximately 35 cm. Further excavations within this trench amounted to an additional one to seven cm. (Fulmer 1977:19). The excavations revealed a dense concentration of burned earth, daub, and charcoal. Also exposed was a large saddle-shaped sandstone metate, resting on top of a presumed storage chamber. Artifacts recovered included small, corner-notched projectile points; bifacial tools; bone tempered, vertically cordmarked pottery; and chipping debris. Water screening operations recovered charred fragments of what was tentatively identified as corn (Zea mays). The association of these remains, particularly the daub, charcoal, and burned earth, indicated that the trench disclosed the remains of a prehistoric structure, which was subsequently labeled House 1 (Fulmer 1977). The chipped stone tool assemblage and pottery were indicative of styles commonly associated with the Plains Woodland period while the presence of maize kernels and two radiocarbon dates (UGa 1345 - A.D. 1060; UGa 1346 - A.D. 980) suggested a possible early Plains Village affiliation. On this basis, the Two Deer site was labeled a transitional Plains Woodland-Plains Village occupation.

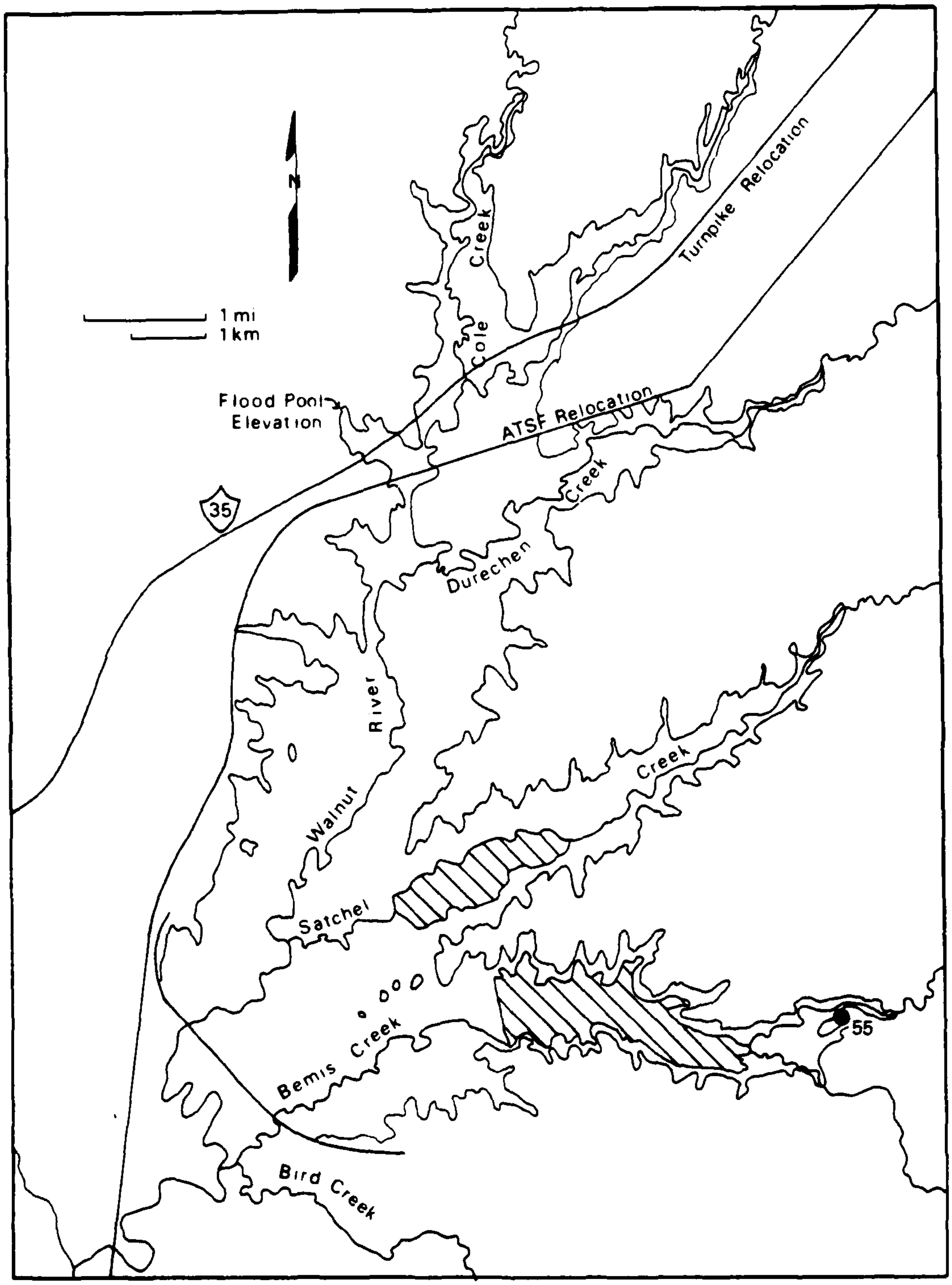

Figure 5.1. Location of the Two Deer site (14BU55) within the project boundaries.

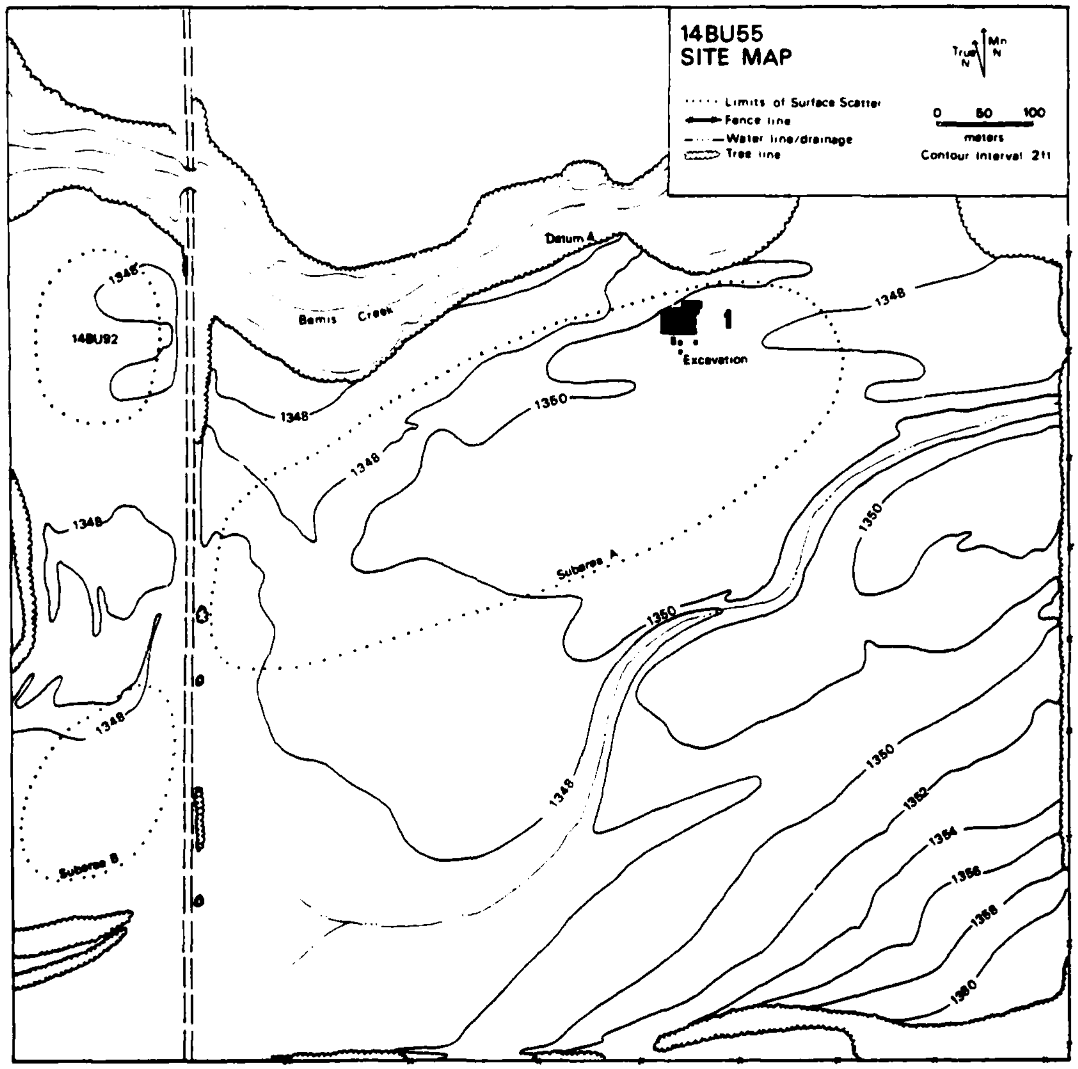

Figure 5.2. Site map (14BU55), showing location of surface scatter and subareas.

Research Design

While the research design for the El Dorado Lake project is directed toward general problems and goals (Leaf 1979), the nature of each site requires a specific and well-defined research design of its own. The 1975 test of the Two Deer site provided the initial data from which a research design could be generated. In order to understand the nature of the prehistoric occupation at Two Deer, three points of interest or problem areas were delineated. These points, described below, governed the extent and focus of excavations at Two Deer and the analyses of material culture remains.

(1) The Two Deer site was labeled a transition between Plains Woodland and Plains Village traditions (Fulmer 1977; Leaf 1979) based on the co-occurrence or late radiocarbon dates with characteristically styled Woodland ceramics and chipped stone tools. The conventional dividing line of A.D. 900-1000 between these two traditions undoubtedly affected the designation as well. However, such a label certainly needs further substantiations and qualifications. If the transition from Plains Woodland to Plains Village is viewed as a continuum in the Central Plains geographical area, the defining characteristics of a prehistoric occupation which temporally falls within the transition, or "gray area", will be subtle. It is only by comparison to typical Plains Woodland and Plains Village sites that the subtly can be more clearly defined. Problems arise, however, in the selection of typical Woodland and Village period sites, as a variety of local phases or expressions exist in both. This is further complicated by the fact that the El Dorado Lake area lacks a well developed chronology for prehistoric occupations, particularly those of the Plains Woodland and Plains Village traditions.

Despite these drawbacks, comparisons can still be made which will aid in delineating the characteristics of a transitory site. Although geographical variations exist in both Woodland and Village period sites throughout the Central Plains, basic artifact inventories and styles are common to each (Wedel 1959, 1962). The large artifact inventory from the Two Deer site allows for meaningful comparisons to be made using ceramics and chipped stone tools. In addition, the presence of structures and evidence of agriculture makes it possible to discuss and compare settlement-subsistence patterns in more specific terms.

Comparisons will be made to the archeologically defined phases of Greenwood (Witty 1973), Grasshopper Falls (Reynolds 1979), Cuesta (Marshall 1972), Pomona (Witty 1967, 1978), Butler (Grosser 1970), and the Middle Ceramic phase manifested at the Uncas site (Galm 1979) to determine the amount of similarity Two Deer shares with each. From such comparisons, the transition between Plains Woodland and Plains Village can be more clearly defined and more clearly applied to the prehistoric occupation at Two Deer.

(2) The presence of the tropical cultigen corn (*Zea mays*) at Two Deer is the first evidence for prehistoric agriculture in the project area. The possibility for a reliance on an agricultural subsistence base by the prehistoric inhabitants of this site is suggested by even the tentative identification of this cultigen.

The adoption of agriculture by prehistoric inhabitants of the Central Plains area in general is an important point in Plains prehistory that has received little attention. While agriculture dominated the subsistence base of Central Plains tradition sites, remains from other prehistoric sites in the Plains area attest to the fact that hunting and gathering continued to be an important activity to many groups until historic times. Why some groups retained their adaptive hunting and gathering strategies while others adopted a subsistence based on corn, beans, squash, and sunflower is not clearly understood. To address this enigma, several points need to be delineated. Two are the documentation of the introduction of cultigens onto the Plains and the acceptance or adoption of these foods by the prehistoric inhabitants. When these events occurred in prehistory is an important step in understanding the beginnings of agriculture. While evidence from the Two Deer site may not fully address this issue, it can aid in determining when agriculture was adopted and how important it was in the subsistence base of prehistoric occupants of south-central Kansas.

(3) The final area of investigation for the excavations at Two Deer will focus on the spatial patterning of the artifactual material within the house structure. This type of analysis of spatial patterns is known as intra-site or micro-level spatial analysis (Clark 1977) and the focus is on the reconstruction of cultural processes which are likely to produce the observed spatial patterning of the material cultural. More commonly, the attention on spatial analysis has been on the level of settlement pattern studies or site catchment analysis. Both are stressed in the research design (Leaf 1976, 1979) as important aspects of the project. However, since Two Deer offers the potential for a micro-level spatial analysis due to the concentration of material culture within a house structure, this level of spatial patterning should not be ignored. While the 1975 tests indicated only one house structure, future excavations will hopefully uncover additional structures, and with controlled data recovery techniques, a micro-level spatial analysis may not only be concerned with the patterning of material in one structure, but the variability of this patterning between structures.

It soon became apparent through the course of investigations at Two Deer, that not all problem areas could be adequately addressed in one field season or in one report. Given the constraints of limited time, limited field and laboratory personnel, and an unexpected density of material culture remains at the site, more than one season was required for the completion of investigations. To date, two years, 1978 and 1979, have been devoted to this end and results of both seasons are combined for this first report on Two Deer. As the 1979 season was a continuation of investigations of the same cultural deposits within a particular area of the site (House 1), a combination of the two seasons allow for a more complete presentation, interpretation, and discussion of the prehistoric occupation at Two Deer. This report, therefore, addresses the validity of defining Two Deer as a transitory Plains Woodland-Plains Village site by discussing the complete artifact inventory, the structures and associated features, the floral and faunal remains, and the chronology, and by further comparing these aspects to both Plains Woodland and Plains Village cultural phases in eastern Kansas and northeastern Oklahoma. Additional problem areas defined in the research design will be addressed in future reports. Despite the more narrowly defined focus of attention for this report, however, the formulation of

field and laboratory procedures required the consideration of all points of interest in the research design.

While this chapter is co-authored, recognition should be given to each author for the various sections for which each is responsible. Sections which discuss the laboratory techniques for the lithic assemblage, the ceramics, and the faunal remains were prepared by Brown. All remaining sections were written by Adair.

Field Techniques

Methods employed in the field investigations at the Two Deer site centered around two tasks. The first task was one of site boundary determination, which was defined by an intensive surface reconnaissance. Within site areas of high cultural debris could also be defined by such a procedure. A preliminary walk through the field indicated surface debris to be too sparse to warrant a grid controlled surface collection. Previous surface collections, conducted by both local amateurs and by Ethne Barnes, had severely depleted the scatter of cultural material. Several grab bag surface collections were conducted by the entire field crews in both 1978 and 1979. Material was collected from an area bounded on the north by Bemis Creek, the west by the section-line road, and the east and south by existing treelines and boundary fences (Fig. 5.2). This area covered approximately 120 acres. Surface debris of subarea A covered an area approximately 450 m. east-west and 210 m. north-south at the widest points within this area. Based on the surface scatter, estimated site size for subarea A is 35 acres or 14 ha.

The second major task focused on the continued investigation of the house structure located within the 1975 test trench. According to Fulmer (1977:18), the completed excavations within House 1 in 1975 were covered with plastic sheets and backfilled at the close of the season. The metate was not removed so as to decrease the disturbance to the site as much as possible. For the subsequent work it was felt best to begin new excavations by tying into the previous grid. Using the topographic map of the site (Fulmer 1977: 17), with the designated datum point, several attempts were made to locate the boundaries of the previous excavation. When these failed, a new grid was established along an east-west line close to where Fulmer's map of the site indicated the previous excavations had been.

Provenience control was established by placing an arbitrary datum point along the treeline in the north edge of the field. A large wooden hub, painted red for easy recognition and placed beneath a large oak tree, was the reference point for datum. Datum height at the base of the stake was assigned the elevation of 100 m. Both the placement of the datum point and the elevation reading were designed in a manner that could easily handle an expansion of the excavation in any direction. The transit was placed close to the planned excavation units and given the Cartesian coordinate values of E100N100.

Excavation units were assigned an arbitrary number in accordance with the procedure used in 1975, in the order in which they were excavated. The

four units excavated in 1975 were labeled 5-9 so that future units could be added on either side. Since it was not possible to locate the previous excavation trench at the start of the field season, unit numbers 1-4 were never used.

All excavation units were 2 by 2 m., an area sufficiently spacious for one excavator, but too large for adequate provenience control of non-three dimensionally plotted material. Each unit was, therefore, divided into four 1 by 1 m. units, labeled quadrants. These were designated one, two, three, and four, beginning in the northeast and moving clockwise. The contents of each level of each quadrant were bagged separately. All tools, pottery, worked stone, and large fragments of bone, charcoal, and daub were three dimensionally plotted and bagged separately.

Excavation units were excavated in 10 cm. levels beginning at the base of the plowzone. Since this latter zone contained artifacts that had been vertically mixed by repeated plowing, it was removed in one 20 cm. level. A total of 51, 2 by 2 m. units (Fig. 5.3) were excavated to 40 or 50 cm. below ground surface. Unit 10 was excavated to a depth of 90 cm. below surface to distinguish any deeply buried cultural deposits and to adequately delineate stratigraphy. Most artifacts were located 30 to 42 cm. below surface (elevation 100.10-99.98) and appeared to be from a single cultural component.

Excavations were conducted with the use of shovels and hand trowels. All matrix was dry screened through ¼-inch mesh to recover small items not always visible during excavation. Features were exposed in place, mapped, photographed, and described on forms.

One half bushel (17.5 liters) of matrix per quadrant per level was collected for the control flotation. The flotation technique employed to process the matrix was similar to that described by Watson (1976:77-100). Features were floated in their entirety and sample numbers were increased from areas of dense cultural debris. Control samples allowed for the recognition of areas of high concentration by indicating the amount of cultural material that tended to exist in a uniform quantity throughout the midden.

All artifacts, charcoal samples, flotation samples, faunal remains, and worked and unworked stone were given unique catalog numbers either as they were excavated or later during laboratory analyses. All catalog numbers used for material collected from Two Deer incorporated the provenience information of each specimen. The 12 digit number begins with the three digit designation A55, for the archeological site designation. The next two digits refer to the excavation unit number, the following two digits to the level of that unit, the next digit to the quadrant within the unit, and the final four digits to the individual artifact number. Thus, the catalog number A55220140012 refers to the twelfth artifact from the fourth quadrant, first level of unit 22.

Large quantities of debitage, daub, and small pieces of charcoal and bone were not given unique catalog numbers but rather, were referred to by the first eight digits of the catalog number of the unit to which they pertained. As an example, daub from the fourth quadrant, first level of

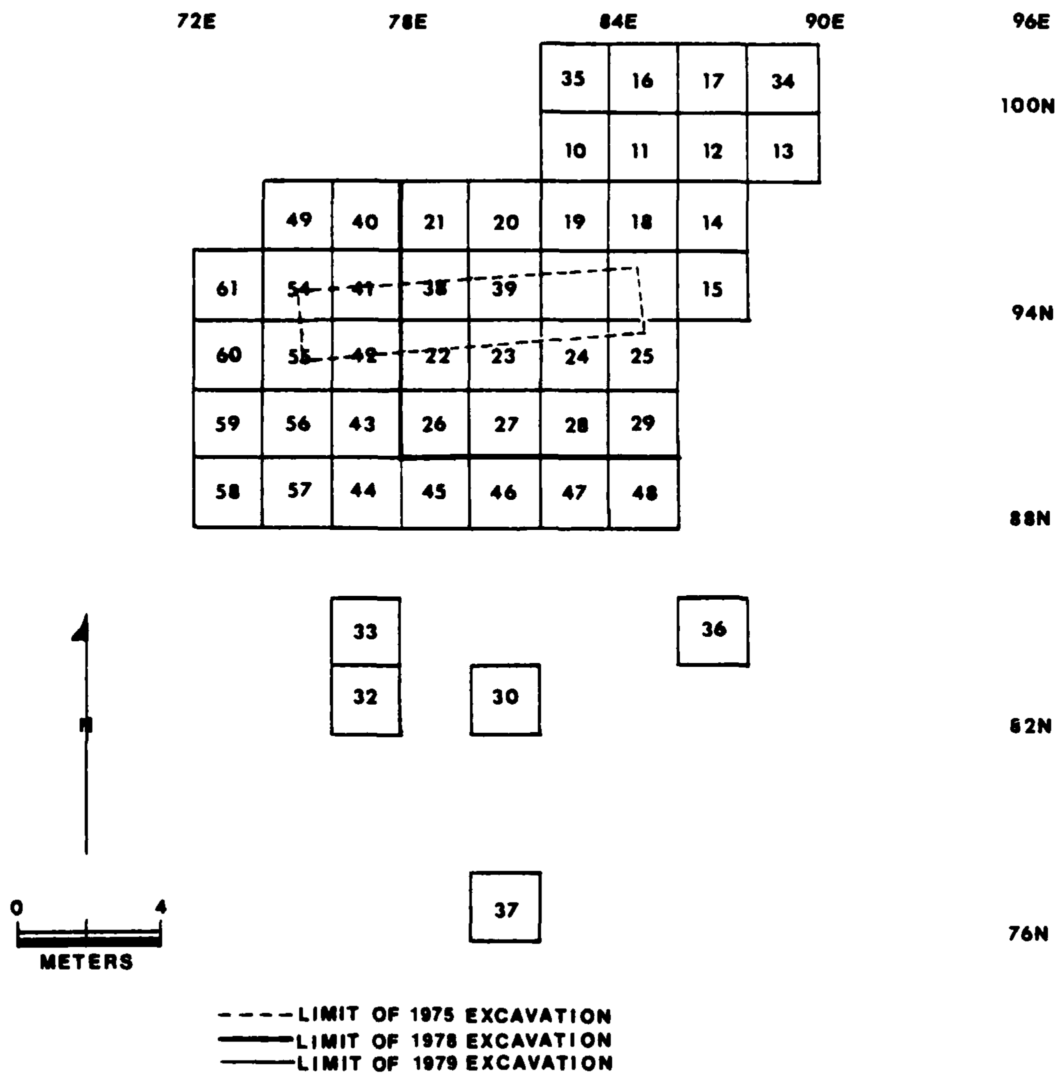

Figure 5.3. Excavation units, 14BU55.

unit 22, was labeled A5522014. It was later weighed and recorded.

Flotation samples were also referenced by catalog numbers. However, the procedure varied between the 1978 and 1979 field seasons. In 1978, control samples were designated according to the provenience, as A5522018-SW (control sample from unit 22, first level, southwest, or third, quadrant). Feature samples incorporated the feature number as well and were designated as A5511039-5 (feature 5, located in the third level of unit 11). The single digit, 8 or 9, distinguished between control and feature flotation samples. In 1979, a field catalog notebook was maintained during excavations so that unique catalog numbers could be designated whenever a specimen was uncovered. Flotation samples were treated in the same manner as artifacts. As the previous years system of distinguishing between control and feature samples was considered unnecessary, this aspect of the catalog system was terminated.

Record sheets, similar to those described by Bohrer and Adams (1977:30), were filled out for every flotation sample. These sheets recorded provenience, excavator, date of collection, associated features, and related information. In addition to flotation records, special forms were used to record features, level summaries, and photographs. Record sheets helped to localize the information from each unit.

Laboratory Procedures

Laboratory procedures focused on: (1) the definition of raw materials; (2) the amount of raw material modification or utilization; (3) the classification of these material into morphological categories; and (4) the identification and recording of selected attributes of each category and/or each specimen.

Analysis of the recovered materials began in the laboratory with the sorting of specimens into categories of bone, charcoal, flora, pottery, sandstone, limestone, daub, burned earth, unworked stone, cobbles, weathered chert, minerals, chipped stone tools, and waste products. All charcoal, daub, burned earth, weathered chert, unworked stone, and cobbles were weighed and cataloged according to their respective excavation unit. When possible, chert type was identified for the specimens in the last three groups. While sandstone and limestone were also weighed and cataloged, they were further analyzed according to the presence or absence of thermal alteration and the degree of modification, such as hammer or pitting marks, grooves, or depressions.

Floral and faunal remains were likewise weighed and cataloged. Floral specimens, which were recovered primarily from flotation samples, were identified to genus and species level when possible. Charred seeds and nutshell fragments from the 1978 season of investigation were sent to Mr. Homer A. Stephans (Professor Emeritus, Emporia State University) for identification. In addition, the help of Dr. Richard I. Ford, University of Michigan, was requested for verifying the presence and species level of domesticated corn, squash, and sunflower. Faunal remains were identified by the junior author with the assistance of Dr. Larry Martin, Museum of Natural History, University of Kansas.

Ceramics comprised one of the more abundant assemblages from Two Deer. Every fragment greater than 5 mm. in any direction in size was three dimensionally plotted in the field and subsequently subjected to an intense analysis in the laboratory. These analytical procedures involved the recording of such attributes as temper, color, interior and exterior surface treatment, mode of manufacture, and vessel size and shape. These defining characteristics could then be used in comparison with ceramic assemblages from contemporary sites.

The most abundant material in the assemblage from Two Deer was chipped chert and debitage, which subsequently received greater attention in laboratory analyses. Chert specimens were first divided into categories of utilized or tested raw materials, cores, morphological chipped stone tool types, and debitage or waste particles. Utilized or tested chert materials represented the category of initial selection and reduction of previously unaltered specimens. Cores are likewise raw materials that have been selected for use in the manufacture of chipped stone tools. However, unlike tested specimens, cores display the presence of prepared platforms for the removal of usable flakes. Well-defined flake scars on one or more faces of the core may represent either the systematic or haphazard removal of flakes from the core.

Waste material or debitage was subdivided into four groups. Flakes were identified by common features of conchoidal fracture, such as striking platforms, bulbs of percussion, ripple marks on the ventral face, and hinge fracture terminations (Crabtree 1972:64). Chips, which display similar characteristics as flakes, were placed in a different category on the basis of maximum length. Chips were defined as a flake less than 2.0 cm. in length, measured along the axis of percussion. Chunks and shatter, defined as irregularly shaped pieces of chert which lack all characterisitcs of conchoidal fracture, comprised the third category of waste material. The final group of debitage, potlids, was comprised of fewer specimens than the previous groups. This specimen, which is usually circular in outline, is defined as a plano-convex flake which produces a concave scar (Crabtree 1972:84). Debitage categories were counted and recorded for each provenience unit, along with weight and number of limestone, sandstone, cobbles, and unweathered chert pieces.

Chipped stone tools also constituted a dominant assemblage of the materials recovered from Two Deer. Shaped tools were identified and grouped according to various technological and morphological characteristics, as defined by Crabtree (1972) and Montet-White (1963, 1968). Attributes recorded for each tool included the continuous measurements of length, width, thickness, and weight. Chert type, edge angle, presence or absence of cortex and thermal alteration, and condition were also recorded. Stem measurements were additional attributes recorded for hafted specimens.

Measurements of maximum length, width, and thickness were recorded to the nearest tenth of a mm., using metal sliding calipers. Width and thickness were measured at right angles to length at the widest and thickest points of the tool. Weight was recorded to the nearest tenth of a gram. Stem measurements of hafted tools were taken according to guidelines provided in Montet-White (1968). Edge angles were determined by using a metal

goniometer. Chert types were determined by defining characteristics described by Haury (Chapter 2, this volume).

The designation "thermal alteration" is used to describe chert which has been modified by exposure to heat. The fact that an artifact shows signs of thermal alteration does not necessarily mean that it was an intentional heat treatment, as quarrying practices could also account for the signs (Gregg and Grybush 1976). Heat treatment as an intentional process is applied to lithic material in order to improve its chipping or fracturing quality.

The presence of a red or pink color is commonly used as an indicator of thermal alteration (Crabtree and Butler 1964, Purdy and Brooks 1971). This criterion was employed for each tool. The color of thermally altered cherts in the El Dorado area ranges from light pink to red or orange-red to gray or black. This color range is well exhibited by specimens of Florence 'A' chert. Thermal alteration is difficult to detect in some cherts, such as Florence 'B' chert and El Dorado light gray chert. Most tools made of these cherts do not exhibit any color change, but the few that do are very light pink in color.

Pot lid scars or thermoclastic fractures are secondary indicators of thermal alteration. Pot lids only occur during the heating process, not during the cooling process; therefore, they are the result of expansion. This occurs when the stress that is causing decrepitation proceeds too rapidly or exceeds the elastic limits of the material (Purdy 1975:136).

Condition of a specimen was recorded by observing the various breakage types. Five breakage types, or fractures, were recognized in the tool categories and are defined below.

(1) The first fracture type, impact fracture, is mainly found on hafted bifaces, but it does occasionally occur on other tool types. It is the result of a direct impact by the tip of the tool, which causes the tip to break if it is structurally weaker than the object it hits. When the tip breaks, a flake, extending from the tip toward the base, is removed from one or both faces of the tool, producing a flake scar reminiscent of a channel scar (Frison 1974:96).

(2) A second type of breakage, direct blow fracture, originates at the point were force is applied. A tiny bulb of percussion and ripple marks may be present along the broken surfaces, indicating the direction of force (Collins 1974:180).

(3) A heat or thermoclastic fracture usually occurs if the chert is heated too rapidly or if the chert is not allowed to cool before it is removed from the heat source. The surfaces of the fracture are usually crenated, or wavy. Surfaces of the break may also exhibit crazing or shrinkage cracks (Purdy 1975).

The analysis described above, along with the proper recording of this information, allow for several important discussions. First, preliminary statements concerning procurement and manufacture of chipped stone tools can

be made by concerning core preparation, frequency of various chert types, and thermal alteration. Second, the recording of materials according to provenience units aids in the recognition of spatial patterning. Third, techno-morphological tool categories permit general indications to be made concerning subsistence related activities. In addition, these tool shapes and sizes, in conjunction with the attributes of the ceramic assemblage, may also be compared with similar styles from temporally related sites to permit a discussion of cultural affiliation and chronology.

The Two Deer Site

Two Deer is a multi-component site with surface materials diagnostic of Archaic, Plains Woodland, and Plains Village culture periods. To date, 212 sq. m. of this site have been excavated, while an additional unknown area has been subsurface investigated with heavy machinery (Fulmer 1977). Subsurface hand excavations have been directed primarily toward one prehistoric occupation that has been identified within and peripheral to two prehistoric structures.

Figure 5.4. Aerial photograph, 14BU55, looking south; note channel scars throughout the field.

Presently, the site is located in a cultivated field that was planted in soy beans at the time of excavations (Fig. 5.4). Excavations were located on a present terrace (T_1) of Bemis Creek. The exact position of this creek at the time of the prehistoric occupation is, however, unknown. As noted in Figure 5.4, the field in which the site is located contains numerous channel scars, presumed to be paleo-channels of Bemis Creek. The channel scars have been initially identified by marked color changes in the vegetation, which are sometimes accompanied by slight changes in the topography. There are two possible explanations for the origin of these channel scars.

Bemis Creek, like other spring-fed creeks in the project area, is known to alter or jump its course and increase its channel flow, particularly during heavy rains or floods. While these course deviations may be only temporary paths designed to accomodate an excessive amount of water, they may remain as permanent channels or marks in the field. Secondly, the 1857 land survey records indicate that Bemis Creek has altered its main course. Fulmer, (1976:30), on the basis of these mid-1800 land survey records, has calculated that Bemis Creek has deviated 100 m. from the south since 1857. It is possible that some of the noticeable channel scars represent earlier (pre-1857) course deviations. The extent to which this stream's movements influenced the location of the prehistoric occupation and subsequent impacts to the archeological deposits are not exactly known. However, excavations indicate that the cultural materials tend to be concentrated both vertically and horizontally within the main structure, suggesting that the post-occupational deviations of Bemis Creek have not significantly disturbed the prehistoric deposits along the T_1 terrace.

In 1978, initial excavations at Two Deer were begun in units 10 to 13, located several m. north of the previous 1975 test trench (Fig. 5.3). At approximately 40 cm. below the ground surface (elevation 100.02), a series of dark circular stains was encountered in units 11 and 12. When carefully cross-sectioned, these stains displayed the characteristics of post molds (see Leaf, Chapter 4, this volume). Excavations were subsequently expanded to the south (units 14 and 15) and to the north (units 16 and 17). Two more post molds were uncovered in unit 17 and several fragments of pottery were found in proximity to the stains. The cluster of post molds, along with the artifacts, was designated House 2. The 1975 excavation trench was located and re-opened shortly after. Additional units were placed around and adjacent to this previous trench.

Due to the limited time available for excavation, and because the 1975 testing had indicated an intact sub-plowzone cultural deposit, a road grader was employed to remove the plowzone. The heavy machinery was brought to the site, however, only after the 1978 excavations had further substantiated the existence of the intact cultural midden well below the surface. Approximately 20-25 cm. of soil was removed from an area south of the 1975 test trench and additional excavation units were gridded within this area.

In 1978, a total of 29 units (10-39) were excavated. At the close of the season, it was obvious that while the excavations had succeeded in identifying a second structure, they had been unable to fully delimit either House 1 or House 2. The second structure had been virtually destroyed by modern agricultural practices and all attempts to define this house had been cancelled toward the middle of the field season. The first structure,

originally labeled House 1 in 1975 (Fulmer 1977), was an entirely different matter. Excavations disclosed large accumulations of daub, charcoal, chipped stone tools, and ceramics surrounding two metates and a small hearth. The density of this material prohibited the expansion of the block excavation to fully delimit the structure within the eight week field season. The thick concentration of burned daub extended into the west wall of the block excavation at the E78 line (Fig. 5.3) while the heavy quantity of tools, pottery fragments and debitage continued also into the south wall (N90 line). At this point, excavations terminated and the site was backfilled.

The following summer, 1979, excavations were continued with the addition of 72 sq. m. to the block excavation (Fig. 5.3). Although still unable to fully delineate the size and shape of House 1 due to a lack of post molds or soil stains, these subsequent excavations significantly increased the artifact inventory and provided additional materials on which to better establish Two Deer as a transitional Plains Woodland-Plains Village site.

A presentation of the site includes a discussion of soils and stratigraphy, radiocarbon dates, structures and features, artifact analysis (ceramic and lithic assemblages), and floral and faunal remains. When appropriate, discussions follow several of these sections.

Soils and Stratigraphy

The Two Deer site is located in the Verdigris silt loam of the Verdigris series soil (U.S.D.A. 1975:20). Soils of this group are frequently found on 0 to 3% slopes in bottomlands throughout Butler County. A representative profile of Verdigris silt loam shows four layers, the upper two of which were distinguished during excavations at Two Deer.

The surface layer, or plowzone, varied in depth between 20 and 25 cm. at the site (Fig. 5.5). This zone was characteristically a dark (10YR 4/2) grayish-brown, silty loam and rich in organic matter. The distinction between this zone and the underlying horizon, A11, was particularly noticeable. This second horizon, Unit I (Fig. 5.5), was a dark (10YR 4/1), silt clay loam with a fine granular structure and is described as slightly acidic (U.S.D.A. 1975:20). Most of the cultural material was located in this horizon. The acidic nature of this soil horizon may have contributed to the deterioration of the faunal material at the site (see Faunal Remains below).

Although a third horizon, A12, is identified at approximately 16 in., or 40 cm. below surface (U.S.D.A. 1975), this zone could not be distinguished from the overlying A11 horizon at Two Deer. Unit 10 was excavated to a depth of 90 cm. below surface and horizon A11 appeared to continue to this depth. The difference between horizons A11 and A12 are described, however, as very gradual and confined primarily to texture (U.S.D.A. 1975). The simplicity of the stratigraphy at Two Deer was further identified by three deep cores taken by Darrel Drew (project geomorphologist) throughout the field in which the site is located. In his opinion, all cores appeared to retain the properties characteristic of horizon A11 to a depth of approximately 13.0 m.

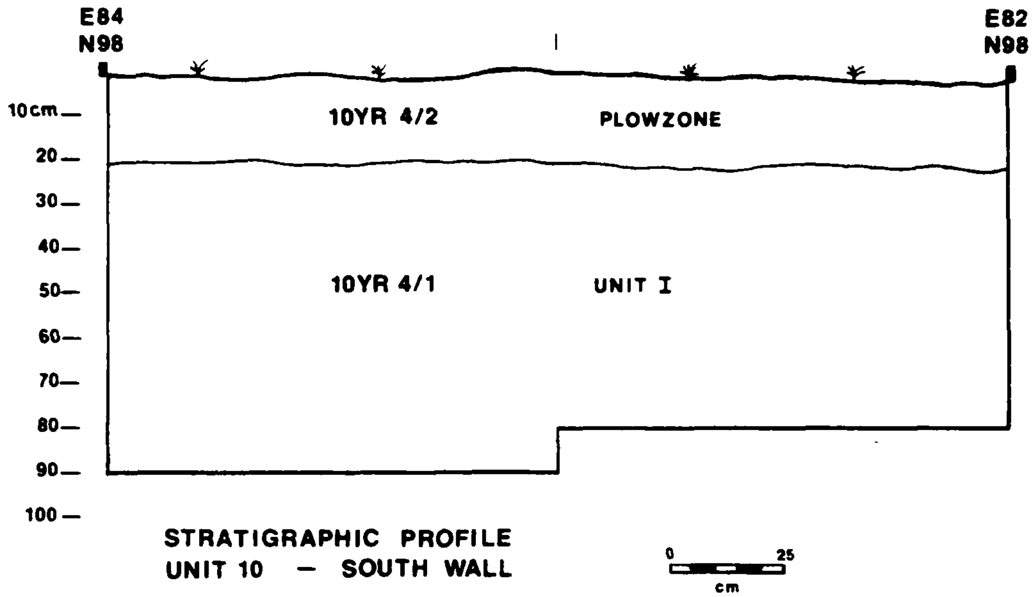

Figure 5.5. Stratigraphic profile, unit 10, south wall, 14BU55.

Radiocarbon Dates

The 1978 excavations at Two Deer disclosed a large quantity of carbonized wood which was of ample size for radiocarbon determination. Although radiocarbon dates were obtained from the previous investigation at the site, additional dates were determined necessary for two reasons. First, few Woodland sites investigated in the project area contained enough carbonized material suitable for dating. Consequently, few Woodland sites have associated C^{14} dates and of those that do, only one, 14BU32 (Leaf and Root 1979), has more than one date. Additional dates from the Two Deer site would aid in the delineation of a chronology of the Woodland sites by providing a tight control on a particular time period. By using Two Deer as a reference point, other Woodland sites can possibly be placed as preceding or following. A second reason for additional dates is due to the suggestion that Two Deer is a transitional site between Plains Woodland and Plains Village complexes. Again, a tight control on C^{14} dates from the site, in association with the artifacts, could aid in defining such a transition. Consequently, five samples of carbonized wood were sent to the Center for Applied Isotope Studies-Geochronology Laboratory of the University of Georgia. The following uncorrected C^{14} determinations were supplied (Table 5.1).

Charcoal samples were revealed by trowel in the field, carefully excavated, and wrapped in clean foil. They were allowed to dry in the laboratory, re-wrapped in foil, and placed in seamless aluminum containers for shipping to Georgia.

Table 5.1. Radiocarbon dates (half-life 5568 years), 14BU55.

Sample	Material	Provenience	Radiometric Date	Calendrical Date
A55170210001	carbonized wood	Feature 6 101.77N,87.27E 100.00 elevation	1065±65 B.P. (UGa 2500)	A.D. 885
A55290130001	carbonized wood	Feature 18 91.25N,84.50E 100.08 elevation	985±45 B.P. (UGa 2501)	A.D. 965
A55100330002	carbonized wood	Feature 1 98.47N,82.66E 99.98 elevation	325±140 B.P. (UGa 2502)	A.D. 1625
A55380240014	carbonized wood	Feature 19 95.10N,78.50E 99.90 elevation	1090±55 B.P. (UGa 2503)	A.D. 860
A55270140020	carbonized wood	92-91N 81-80E 100.06 elevation	950±135 B.P. (UGa 2504)	A.D. 1000
	carbonized wood	House 1	890±60 B.P. (UGa 1345)*	A.D. 1060
	carbonized wood	House 1	970±80 B.P. (UGa 1346)*	A.D. 980

*Radiocarbon dates from the 1975 excavations (Fulmer 1977).

With the exception of sample 3, A55100330002, the radiocarbon dates are considered reliable as they are fairly consistent dates and cluster closely together. At present, there is no known explanation for the contamination of sample 3 that could have taken place in the field or in the laboratory. There was no indication during excavation that the carbonized sample was disturbed by rodent activity or by the plow. Without contamination, the date reflects a later time period. However, excavations at Two Deer did not indicate protohistoric or historic activities. Preliminary assessment of this date for the prehistoric occupation at Two Deer indicated that it should be deleted.

The statistical tests for non-coevalness described by Long and Rippeteau (1974:210-5) allow for a determination of significance of difference of age for radiocarbon dates. These tests were applied to the radiocarbon dates

from 14BU55. Results indicate that the sample 3 date of A.D. 1625 falls well outside the range of acceptable dates based on the calculation of the average sigma. This date may, therefore, be statistically rejected. An average date for the remaining samples from Two Deer, including the two dates obtained in 1975, is A.D. 1000±25.

Structures and Features

Two structures have been recognized at Two Deer; the first was initially disclosed in 1975 (Fulmer 1977) and the second by the more recent investigation in 1978 (Fig. 5.6).

In the absence of soil differentiations and a defined post mold pattern, House 1 was identified by the presence of a subsurface daub and charcoal concentration, associated metates, large quantities of tools, pottery fragments and debitage, and several isolated post mold stains.

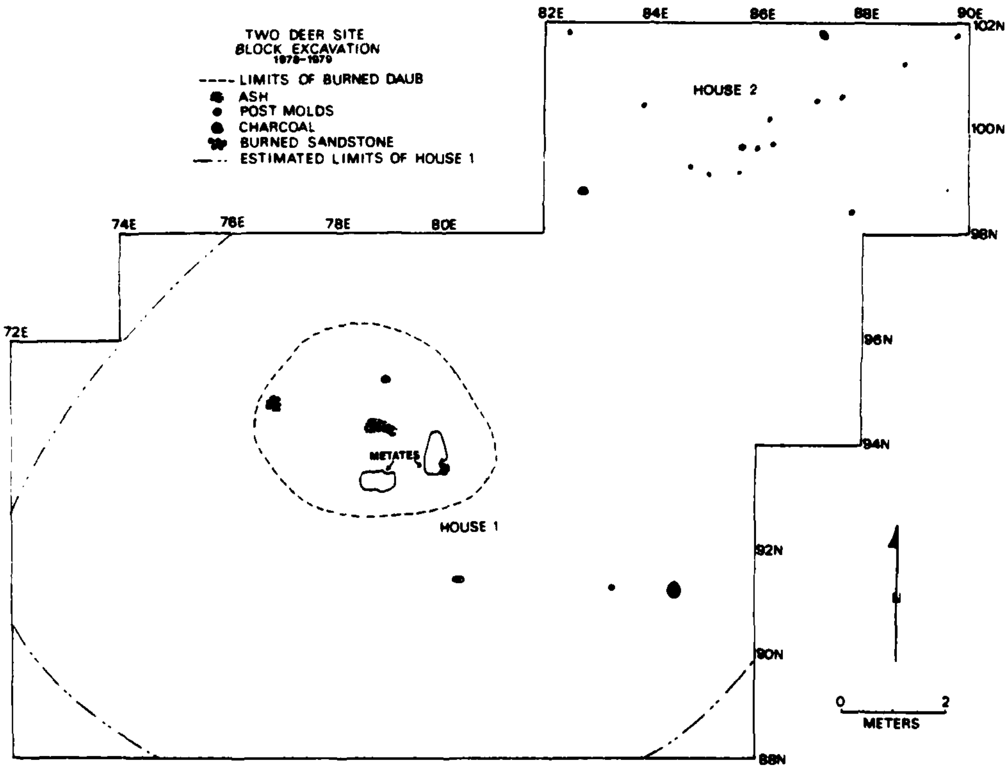

Figure 5.6. Block excavation showing location of houses, 14BU55.

The strongest argument for the presence of this structure is the abundance of burned daub. An approximate total of 5.0 kg. of this material was recovered from the block excavation. The heaviest accumulation of the grass, stick, and pole impressed daub came from units 21, 22, 38, 39, 41, and 42, where the concentration measured from three to seven cm. in depth. Most of the yellowish-red daub fragments exhibit a rough inner surface and a smooth, grass-impressed outer surface. The grass impressions on one surface only suggests that a layer of mud was first applied to the frame of the structure, with the grass then being placed on the exterior surface. A few fragments of daub show grass impressions on both surfaces, indicating that the structure was either patched in certain spots or that more than one layer of mud and grass was applied during construction. Several fragments of daub display parallel post impressions (Fig. 5.7), a further indication of the wattle and

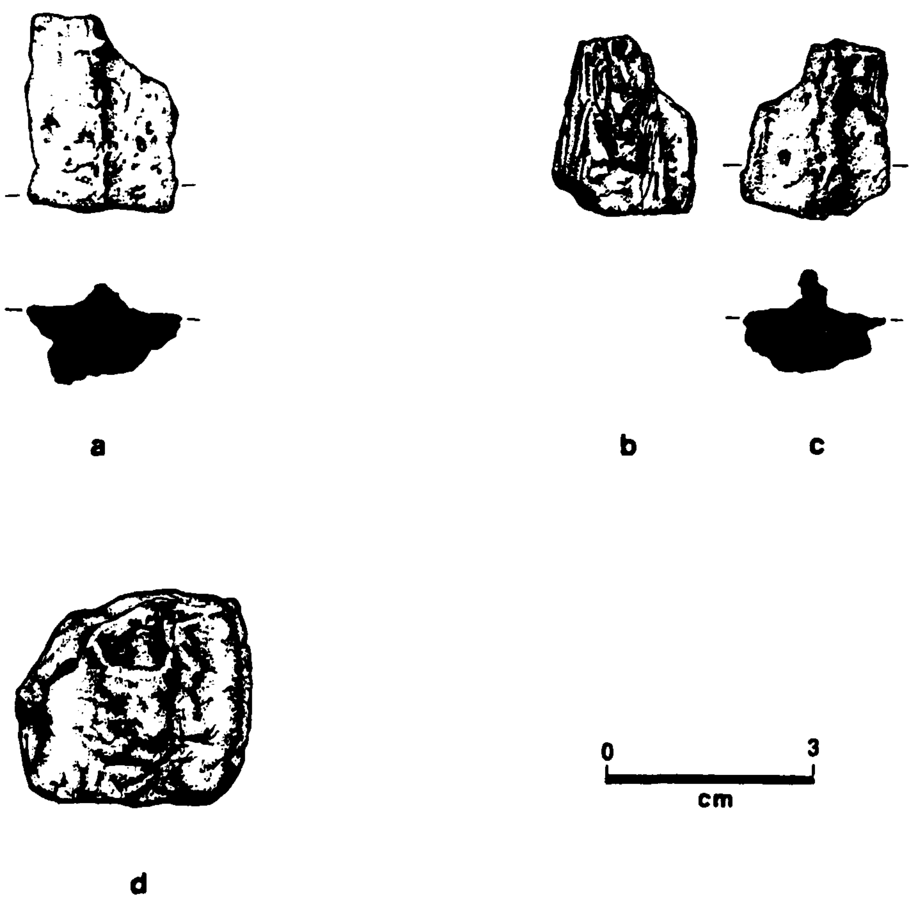

Figure 5.7. Daub fragments from House 1 (a,b,c), showing interior and exterior surfaces and cross-sections and; mud daubers nest (d) associated with this structure.

daub technique of manufacture. A mud dauber's nest (Fig. 5.7d), recovered from excavations, is associated with House 1.

Two metates were found within the area of the daub concentration (Fig. 5.6). The largest metate was manufactured from a fine-grained pinkish-white sandstone and is roughly saddle-shaped in outline. The second, smaller metate, is made of limestone. These grinding implements are assumed to be lying on the floor of the structure, although a distinct floor could not be identified. Burned daub was uncovered in quantity above the metates, suggesting that the structure burned and collapsed and the metates left in place by the prehistoric inhabitants. Both metates were fragmented, although this may have been caused by the weight of the grader used to remove overburden in 1975 (Fulmer 1977:27).

In proximity to the metates was an accumulation of consolidated ash (Fig. 5.6). Measuring 30 cm. by 50 cm. and 8 cm. in depth, this material may be interpreted as either hearth cleaning debris or the base of an interior hearth, possibly a small house-warming hearth. The area immediately surrounding the ash is noticeably void of artifacts. While small chips and flakes are relatively numerous, ceramics and chipped stone tools are absent, suggesting that the ash represents more than just redeposited material. Limestone pieces, commonly found associated with a hearth, may have been removed by the prehistoric inhabitants or displaced by the collapse of the structure.

Also located within the limits of concentrated daub was an accumulation of fire-reddened sandstone (Fig. 5.6). Marshall (1972) describes hearths located in sites in the Elk City reservoir area as concentrations of burned sandstone and limestone in shallow depressions. However, data from the Two Deer site do not suggest the burned sandstone concentration to be hearths similar to those found by Marshall. Most of the pieces are small (>20.0 gm.) and were not located within a pit or depressed area. In addition, several of the specimens exhibit a groove or parallel grooves on one surface (see Worked stone, below). The presence of this modification suggests that the sandstone functioned as abraders in the manufacture of bifacial tools or the manufacture and maintenance of arrow shafts rather than as hearthstones.

Well defined storage pits were absent from the interior of House 1. While Fulmer (1977:28) reported a dark circular stain, about 80 cm. in diameter and situated, in part, under the sandstone metate, this could not be identified as a storage pit. Repeated fine troweling of the area and observation of water absorption differentiations did not reveal a well defined outline of a refuse pit. However, as a measure of safety, all matrix from the 1 m. by 1 m. quadrant that encompassed the suggested pit was flotated. An examination of the flotation fraction revealed several charred maize kernels (Zea mays) along with charred native flora. On this basis, the dark circular stain reported by Fulmer (1977) is interpreted as an area of high organic content resulting from repeated usage of the metate.

One possible shallow refuse pit was identified (Fig. 5.8) toward the end of excavations within the structure. This feature was identified in the field as an area concentrated with charcoal, burned earth, and bone fragments which extended below the distribution of tools and the assumed

living floor. Approximate dimensions of this feature are 20 cm. by 25 cm. and 9 cm. deep. It is possible that at one time this feature was more clearly defined but has since been destroyed by natural or cultural agents.

Two post molds were associated with House 1. One, located toward the center of the structure in proximity to the ash concentration, is a portion of a charred post (Fig. 5.8). This feature may represent either a central support post for House 1 or a post associated with the hearth remains. The second post mold is located to the southeast (Fig. 5.8) and is a stain measuring 8 cm. by 7 cm. by 7.5 cm. deep.

House 2 is represented by a series of post molds that outline a portion of a rectangular structure with rounded corners. The structure is aligned northeast to southwest. Thirteen post molds (Table 5.2) were identified in the area E82-90, N98-102 (Fig. 5.8). Distance between the post stains varied from 20 cm. to approximately 1.0 m. The stains demarking the rounded corner were much closer (7-10 cm.) than the others. Extensive rodent activity was noticeably close to several post stains. Post molds were distinguished from rodent cavities by the same criteria discussed by Leaf (Chapter 4, this volume). Matrix from the cross sections of the features was saved and flotated.

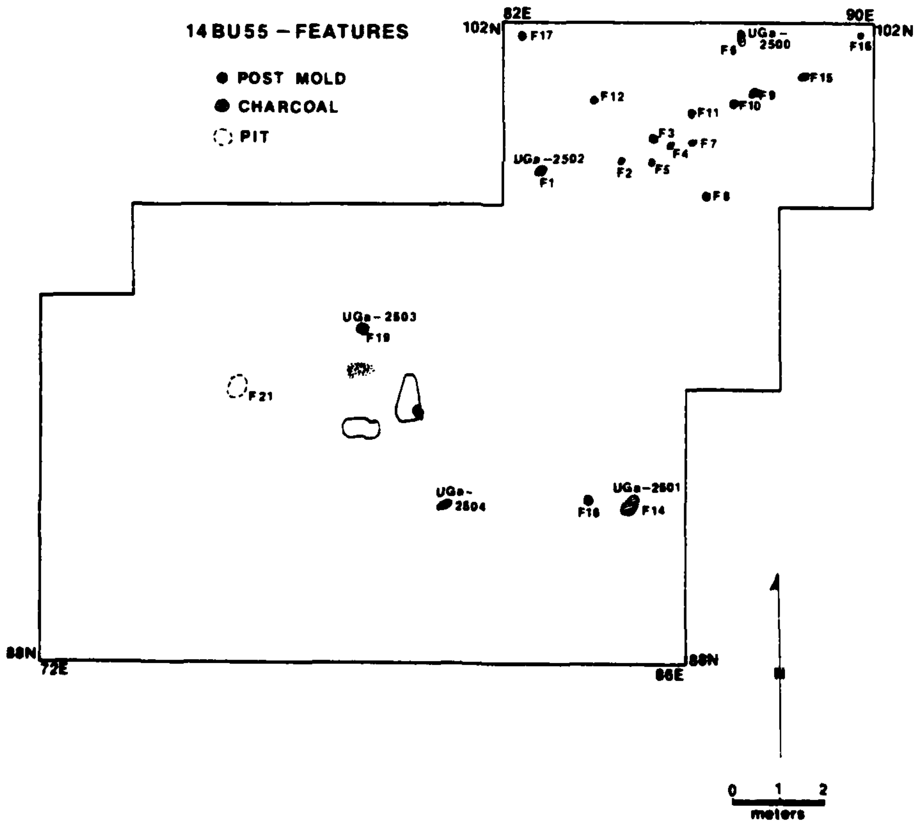

Figure 5.8. Plan view of features, 14BU55.

Table 5.2. Location and size data for post molds from House 2, 14BU55.

Sample	Provenience	Dimensions	Depth
Feature 2	99.30N, 84.80E 100.02 elevation	7.0 cm. in diameter	12.5 cm.
Feature 3	99.26N, 85.10E 100.00 elevation	6.6 cm. in diameter	9.0 cm.
Feature 4	99.30N, 85.70E 99.99 elevation	6.0 cm. in diameter	10.5 cm.
Feature 5	99.65N, 86.82E 100.03 elevation	10.5 by 7.0 cm.	7.5 cm.
Feature 7	99.58N, 86.10E 100.04 elevation	10.0 by 5.0 cm.	6.3 cm.
Feature 8	98.76N, 86.31E 100.00 elevation	9.0 cm. in diameter	7.2 cm.
Feature 9	100.52N, 87.69E 100.00 elevation	8.0 by 6.5 cm.	11.5 cm.
Feature 10	100.48N, 87.12E 100.00 elevation	8.0 cm. in diameter	6.5 cm.
Feature 11	100.14N, 86.27E 100.00 elevation	7.0 cm. in diameter	7.5 cm.
Feature 12	98.46N, 84.88E 99.96 elevation	7.0 by 6.0 cm.	6.0 cm.
Feature 15	101.80N, 89.74E 100.02 elevation	8.0 cm. in diameter	4.0 cm.
Feature 16	100.48N, 83.92E 100.04 elevation	11.5 by 7.0 cm.	5.5 cm.
Feature 17	101.87N, 82.40E 100.04 elevation	7.0 by 5.0 cm.	3.5 cm.

As previously mentioned, the exact limits of House 2 could not be identified. Daub and artifacts, so abundant in House 1, were virtually absent from House 2. The dense concentration of burned daub in House 1 is an obvious indication that this structure burned. While House 2 shows no indication of burning (such as burned daub, burned earth, or charcoal), it is possible that all evidence has been destroyed by recent agricultural practices, as this house is situated on the edge of a terrace of Bemis Creek. It is impossible to determine at this moment, whether both houses were occupied at the same time or whether one was occupied and abandoned prior to the occupation of the other. Radiocarbon samples were collected from the interior of both houses (UGa 2500-House 2; UGa 2503-House 1) and the resulting dates indicate no significant temporal separation.

Additional features, other than the post molds, hearth and refuse pit, were identified during excavations. These include charcoal concentrations and limestone or hearthstone concentrations.

Features 1, 6, and 14 were large concentrations of charcoal that did not appear to have burned in place, as there was no burned earth recovered from the surrounding areas. Feature 6 was located in the interior of House 2 while feature 14 was located in closer proximity to House 1 (Fig. 5.8). Both are interpreted as part of the respective structures, possibly roof beams or posts, that burned and collapsed. Feature 1 was located in unit 10 and may not be associated with either structure. Samples from all three concentrations were used for radiocarbon dating and are described in Table 5.3.

Two limestone concentrations were located in units 33 and 36 (Fig. 5.9). Both features consisted of a pile of burned and discolored limestone fragments that are thought to be hearth cleaning debris. These isolated piles of limestone may represent residue that was removed periodically from the interior hearth, an activity commonly referred to in ethnographic accounts (Yellen 1977:143). At Two Deer, there was no indication of _in situ_ burning around these concentrations and little material was recovered in the flotation samples from these areas. Since neither concentration appears to be associated with the interior of either house, exterior hearths may have

Table 5.3. Location and size data for charcoal concentrations, 14BU55.

Feature	Unit	Provenience	Dimensions
1	10	98.47N, 82.66E 99.98 elevation	7.0 by 4.0 cm. 6.0 cm. in depth
6	17	101.77N, 87.27E 100.00 elevation	10.0 by 6.5 cm. 8.0 cm. in depth
14	29	84.50N, 91.25E 100.00 elevation	25.0 by 21.0 cm. 13.0 cm. in depth

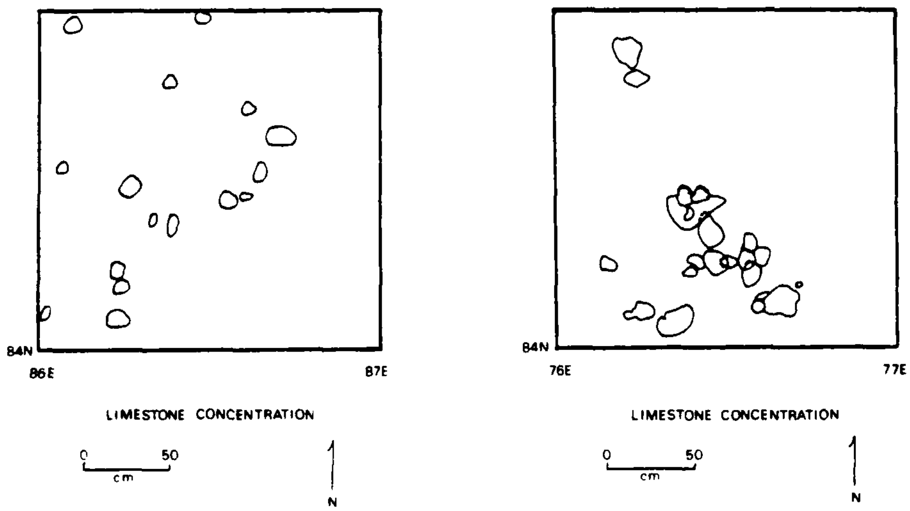

Figure 5.9. Limestone concentrations, 14BU55.

occurred at this site. However, since both of these concentrations were located in 2 by 2 m. units within the graded area, the actual extent of the scatter is unknown.

While the exterior walls of neither structure were clearly delineated, the overall shape of houses at Two Deer appear to be oval to rectangular with rounded corners. The approximate size, identified by only House 1, is 12 m. in diameter. This estimate is based on the horizontal and vertical distribution of material culture remains and may not represent the actual size of the prehistoric structure. Certainly, a house this large would be expected to have large support posts associated with it, that would have left stains in the soil demarking their location. It seems unlikely that a structure 12 m. in diameter could be adequately supported by a super-structure of posts measuring 6.0 cm. and 9.0 cm. in diameter and spaced 20 cm. to 100 cm. apart. It is possible that the distribution of artifacts delimiting the estimated boundaries of House 1 represents activities carried on both inside and immediately outside the structure. This would indicate that House 1 is actually smaller than estimated. It is likewise possible that the distribution of materials represents more than one occupation or more than one structure which overlap each other. Again, this would undoubtedly result in a structure smaller than 12 m. in diameter. However, several lines of evidence indicate that this suggestion is not plausible. If more than one occupation or structure is represented by the arrangement of artifacts, the horizontal and vertical distribution of these materials should delineate the appropriate boundaries. In particular, the two metates should represnet separate occupations. If this were the case, cultural material should exist beneath the one metate that

is associated with a later occupation. As no cultural material was found directly beneath either grinding implement, both are accepted to represent the same occupation. As stated previously, these tools are assumed to have been lying on the living floor of the structure.

The horizontal distributions of chipped stone tools and ceramic fragments within the block excavation were calculated and are displayed in Figures 5.10 and 5.11. Both distribution maps clearly show the concentration of materials around the metates and hearth, or approximately the estimated center of House 1. In addition, several excavation units within this area display large quantities of both chipped stone tools and ceramics. This suggests that the activities associated with each of these assemblages were not only conducted within the structure, but were also conducted in close proximity to each other.

According to ethnographic accounts provided by Yellen (1977:143), hearths provide the focus for the majority of activities which occur within a structure. Debris that builds up around this feature is often indicative of numerous activities associated with each nuclear family group. While the size and family association of the group that occupied House 1 at Two Deer is unknown, the quantity of cultural debris found associated with this prehistoric occupation suggests that the structure may have been occupied for an extended amount of time, perhaps at least longer than one season. A lengthy occupation and a variety of activities could help to account for the scattered distribution of materials.

Architectural remains at Two Deer can, therefore, be characterized as relatively large (actual size unknown), oval to rectangular structures constructed on ground level and at least partially daub covered. Structures are located along the edge of the T_1 terrace and are situated in close proximity to each other. Interior features consist of grinding implements, a small hearth, and a poorly defined shallow pit. At least one interior post is evident which may represent a support post. Exterior features were identified by the concentration of fire-reddened limestone, possibly remnants of hearths or redeposited residue from the interior hearth. The presence of an interior hearth suggests that the structure may have been occupied during the winter months when such a feature was needed for warmth.

Discussion

The architectural structures at Two Deer, their mode of manufacture, and associated internal and external features allow for comparisons with other sites in areas adjacent to the project area. Prehistoric structures that may be used in such a comparison come from sites assigned to the Pomona focus (Marshall 1972; Rohn, Stein and Glover 1977; Schmits, Reid and O'Malley 1980; Wilmeth 1970; Witty 1978), the Grasshopper Falls phase (Reynolds 1979), the Cuesta phase (Marshall 1972), the Bluff Creek complex (Witty 1978), and the Plains Village manifestation at the Uncas site (Galm 1979).

The Cuesta phase, identified from materials recovered from component B at site 14MY305 in the Elk City reservoir (Marshall 1972), is the earliest period site used in this comparison. Two radiocarbon dates, A.D. 780±80 and

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PREHISTORY AND HISTORY OF THE EL DORADO LAKE AREA, KANSAS. PHAS--ETC(U)

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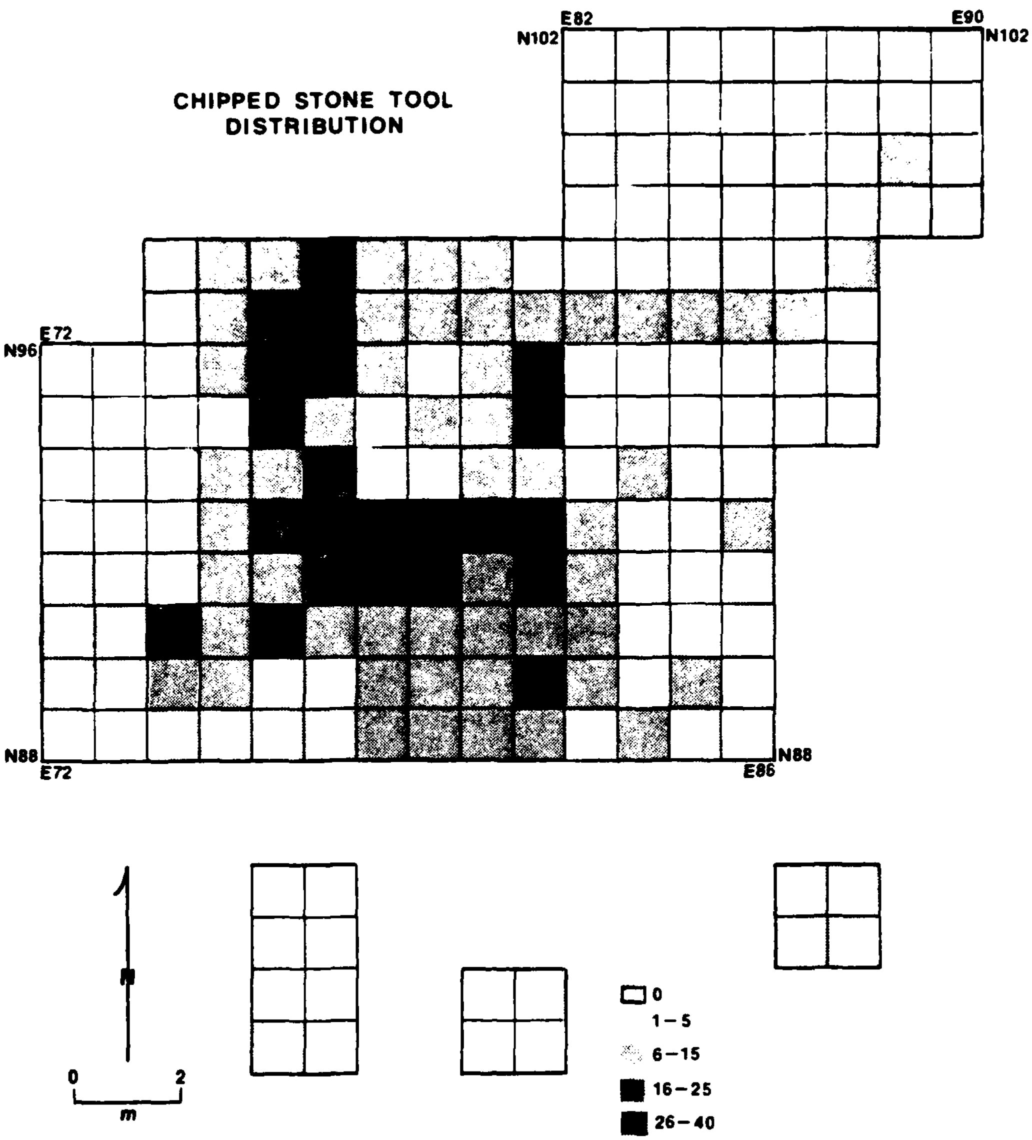

Figure 5.10. Chipped stone tool distribution, 14BU55.

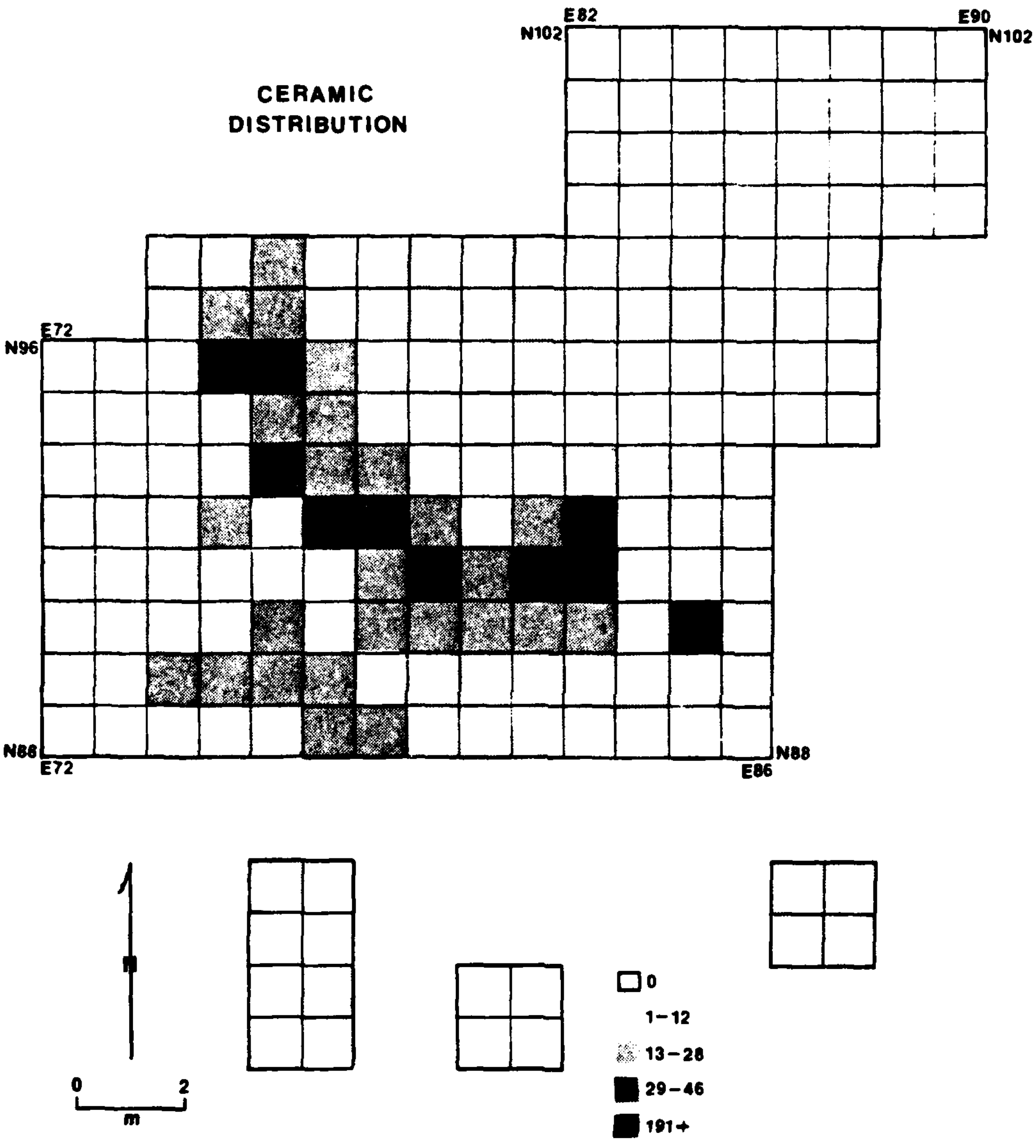

Figure 5.11. Ceramic distribution, 14BU55.

A.D. 970±80 were obtained from charcoal samples associated with the occupation of five prehistoric structures. Structures were identified by large oval to circular post mold patterns that varied in size from 36 ft. (11.0 m.) to 50 ft. (15.3 m.) in diameter across the long axis and 28 ft. (8.5 m.) to 40 ft. (12.2 m.) in diameter across the short axis. Although randomly distributed across a site, structures were spaced close together. Interior hearths and pits are present. Hearths, described as concentrations of burned sandstone and limestone in shallow depressions, do not show evidence of <u>in situ</u> burning. Pits are shallow features that exhibit in-sloping walls and lack artifactual materials.

Several similarities to the architectural remains at the Two Deer site are evident. The large size of the structure with interior hearths and shallow pits, and their close proximity to other structures are all features common to the Two Deer site. Aside from these characteristics, however, little else between the two manifestations is similar. The ceramic assemblage of the Cuesta phase consists of Havana and Cuesta ware while the hafted bifaces are styles commonly associated with the atlatl rather than the bow and arrow. While it may be that Cuesta phase is ancestoral to the occupation at Two Deer, the commonalities in structures between the two are not enough to warrant such a suggestion.

A second Early Ceramic period phase that can be used in a comparison is the Grasshopper Falls of northeastern Kansas. Located within the drainage area of the Delaware River, Grasshopper Falls phase is a fairly recently recognized Plains Woodland cultural complex (Reynolds 1979). Architectural remains were identified by oval patterns of shallow, fairly light, poles. Size ranges from 24 ft. by 21 ft. (7.3 m. by 6.4 m.) to 13 ft. by 11 ft. (3.7 m. by 3.3 m.). Internal features such as hearths and storage pits are lacking. Burned clay daub, found associated with the post impressions, suggest a wattle and daub mode of manufacture. The latter characteristic is the major similarity to the structural remains at Two Deer. However, the relatively light construction of Grasshopper Falls phase structures, the lack of internal hearths and the limited associated artifact inventory are in direct contrast to the Two Deer site and suggest that the Grasshopper Falls structures were not inhabited for long periods of time. In addition, a single date of A.D. 760±90 indicates a much earlier occupation span than that of Two Deer.

The Bluff Creek complex is identified from sites in the Chikaskia and Ninnescah River drainages of south-central Kansas. Radiocarbon determinations from one site (A.D. 1050) place this complex to the Middle Ceramic period (Witty 1978). Small village sites assigned to this complex are composed of square, oval, and rectangular frame structures that were partially daub covered. The grass and pole impressed daub is an indication of a wattle and daub manner of construction. The structures were built on level ground and contained interior storage pits. All structures lacked signs of interior hearths.

With an average date of A.D. 1000±25, the Two Deer site appears directly contemporary with the Bluff Creek complex. Geographically, the two are separated by approximately 82 miles. Architectural remains excavated at both exhibit several similarities. First, structures at Two Deer and Bluff

Creek were constructed on ground level rather than semi-subterranean. Second, a wattle and daub mode of manufacture resulted in oval, round, or rectangular houses that were at least partially daub covered. Third, interior storage pits are present. Dissimilarities between the two are also present, the most important being the lack of interior hearths in Bluff Creek complex structures. Well defined cylindrical storage pits located outside the structures at these sites was also not an observed characteristic at Two Deer. Finally, without a given size of the Bluff Creek structures, a complete comparison cannot be made.

Another source of comparative material is from the Pomona focus of eastern Kansas. Structures characteristic of this manifestation occur as single or paired houses constructed on ground level. The predominant oval shape measures approximately 8 m. by 4.5 to 5 m. in size. Center posts are sometimes present and occasionally occur in J- or T- shaped interior patterns. Storage pits occur both in and outside the houses while interior hearths are infrequent. One dominant feature of these structures is the presence of large amounts of fired daub bearing grass and pole impressions (Witty 1978:60).

Several similarities to the architectural remains at Two Deer are noticeable. The large amount of burned daub associated with a less than ordered wall post pattern is a major characteristic shared between Two Deer and Pomona sites. Ground level construction is an equally important characteristic associated with both manifestations. However, the small size, interior post patterns, and exterior storage pits of Pomona structures are unlike those found at Two Deer.

A final source for comparison with the Two Deer site is the Uncas site in north-central Oklahoma (Galm 1979). Two houses excavated at this site have been described as semi-subterranean with daub or grass covered exteriors. Post mold stains delimited square to rectangular structures measuring approximately 6 m. by 6 m. to 4 m. by 4.75 m., respectively. The basic four center post support pattern typified the houses. Remnants of central hearths were present in the interior of each, as was a well-defined bell-shaped pit. Radiocarbon dates place this site within the Middle Ceramic period (Galm 1979:29-30).

When comparing Uncas and Two Deer houses, several similarities and dissimilarities are apparent. The only major characteristic shared by both house types is the presence of an interior hearth. The relatively small size of the Uncas site houses, the semi-subterranean construction, and the presence of four central support posts and bell-shaped pits are features totally dissimilar to the architectural remains at Two Deer.

From the above discussion, it is apparent that the architectural remains at Two Deer exhibit several similarities to prehistoric structures identified from both earlier and later period manifestations. Varying amounts of similarities are noted between all phases, complexes, or sites presented. While some of these characteristics may be found in sites throughout the Central Plains area and are thus pan-Plains in nature, others, such as ground level construction, may be of greater importance in establishing cultural

affinities. While it is realized that the lack of a well-defined house size and shape from Two Deer limits the extent of some comparisons, the preceding discussion is presented as an initial and important section toward establishing cultural and chronological ties. However, such relationships are better substantiated with the consideration of all cultural remains from sites, rather than just architectural remains. Other aspects of the sites and cultural remains will be compared in the appropriate sections of this chapter, with a final section culminating all of the comparisons.

Artifact Analyses

Ceramic Assemblage

A sample of 2044 sherds was recovered from Two Deer during the three years of excavation (Table 5.4). This total includes 68 rim sherds, four base fragments, and 1972 body vessel fragments. Several of the recovered fragments cross-mend (Fig. 5.12), reducing the total sample to 1976. From this total, 408 sherds, or approximately 21% of the sample, was subjected to an intense analysis. This subsample was comprised of all of the rim sherds and a portion of the body sherds over three mm. in any direction. The analysis focused primarily on information concerning temper, color (slip, interior color, exterior color, and core), surface treatment (interior and exterior), finishing technique, presence of carbon streak, placement of cordmarking, cord width, cord twist, and thickness. In addition, four variables were also recorded for the rim sherds. These are lip thickness, rim thickness, rim height, and when possible, orifice diameter.

Some variables, such as interior and exterior color and thickness, are purely descriptive. Others, such as surface treatments, finishing techniques, and the presence of a carbon streak relate to manufacturing techniques. The recording of a variable such as cord twist provides information on the idiosyncracies of individual potters and the possible presence of more than one potter in the house.

Table 5.4. Ceramic assemblage, 14BU55 (1975-1979).

	1975	1978	1979	Total
Body	30	872	1070	1972
Rim	2	46	20	68
Base	-	2	2	4
Total	32	920	1092	2044

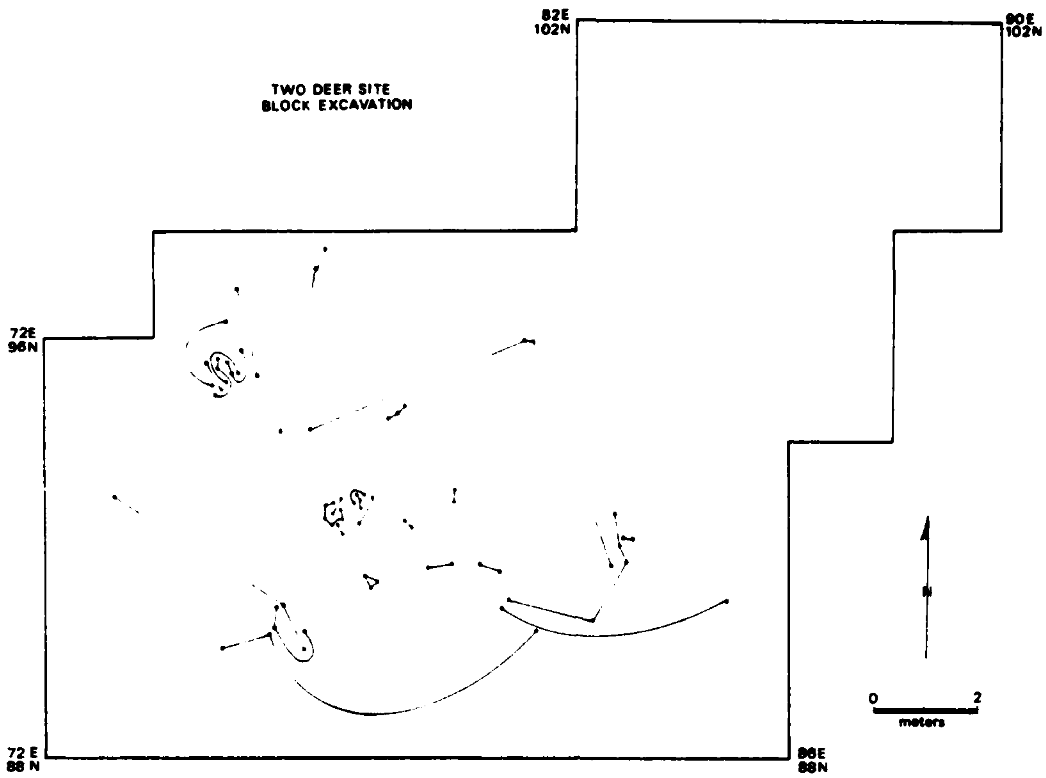

Figure 5.12. Distribution of cross-mended ceramic fragments, 14BU55.

On the basis of these attributes (presented in Table 5.A1), the ceramics from Two Deer can be characterized as follows:

Temper: The temper consists of burned, crushed bone, indurated clay or sherd, limestone, grit, and grit and bone. Bone is the primary tempering agent (Table 5.5). The bone is burned and crushed and is softer than the surrounding matrix. To the unaided eye, it appears as a white powdery substance. However, when viewed under a 30x binocular microscope, internal structures of the bone and bone cavity are visible. Lacunae are often present on the surface of the shreds. These are areas from which the temper has been leached.

Indurated clay or sherd tempering was represented in 10% of the sample (Table 5.5). Several of these sherds also exhibited small pieces of bone tempering as well. Both indurated clay and sherd are angular and irregularly formed inclusions. While they are usually lighter than the surrounding matrix, they may be harder or softer than the paste. Indurated clay is hardened, unfired clay and it may be present as a natural paste inclusion (Nickel 1973:39). Sherd temper is crushed potsherds. In some cases, it can be detected by the presence of old sherd surfaces or by the presence of temper within the sherd temper.

Table 5.5. Temper type frequencies, 14BU55.

Temper	1978-1979 Excavations	%
Bone	329	81.0
Indurated clay/sherd	42	10.0
Limestone	2	.4
Grit	1	.2
Indeterminant	3	.6
Absent	31	7.8
Total	408	100.0

Crushed limestone, present in .4% of the sample, is angular and irregular in form. It is often identified by its characteristic nature to effervesce when hydrochloric acid is applied.

Grit, or unidentified crushed rock, is also represented by only a small percentage (Table 5.5). These inclusions are irregular and angular to subangular in shape. Like limestone, the grain size usually varies within a single sherd.

In addition to the above temper groups and combinations, three sherds are tempered with an indeterminate inclusion. This has been leached out, leaving only lacunae. The breaking of small fragments off these sherds failed to reveal any preserved temper. There are also several sherds which appear to be untempered.

Color: Although several single sherds in the assemblage exhibit a wide range of variability in color, all sherds fall within the YR- range of the Munsell Soil Color Series. This means that all colors are variations of red-yellow hues. Colors within the 10YR group are the most common, with shades of buff, brown, and gray within the group being the most numerous. Vessel color ranges from very dark gray (10YR 3/1) to pale brown (10YR 6/3) on the exterior with the interior tending towards the darker colors. Vessels exhibiting colors in the 5YR hue (reddish-brown) are present but do not predominate.

The cores of the majority of the sherds have a carbon streak, indicating incomplete oxidation of organic matter present in the clay during firing. In these cases, the cores are dark, with colors ranging from gray to dark

gray (10YR 3/1 to 10YR 6/2). Approximately 60% of the rim sherds are fully oxidized, as evidenced by their lighter core color. These rims indicate possible firing techniques. Since most of the body sherds have carbon streaks but the majority of the rims have light colored cores, the vessels were probably fired upside down. As a result, the rims would have been in closer contact with the fire, giving them a better chance of being fully oxidized. The further a vessel's distance from the fire, the less chance it had of being fully oxidized.

Finishing technique: The presence of coil-bond breaks on ten sherds indicates that the method of manufacture was coiling. In most cases the finishing technique was paddle-and-anvil. This is confirmed by the presence of cordmarking on sherd exteriors and by the presence of anvil indentations on sherd interiors.

Surface treatment: The predominant exterior surface treatment is overall cordmarking (Table 5.A1). This was done by striking the surface of the pot with a cordwrapped paddle. There are several variations of this treatment. A few sherds are cordmarked and slipped. In these cases, the vessels were first cordmarked and then a slip was applied over the cordmarks. A slip is a thin layer of clay, applied to the surface of a vessel. Two sherds, A55270130023 and A55270110013, are cordmarked and incised. Both have two parallel lines that were incised on the pots after they had been cordmarked. The lines are perpendicular to the cordmarks. Cordmarks and striations are present on sherds A55320310001 and A55360110004. The striations appear to have been applied with a firm, narrow implement to the surface of the vessel after the clay was already in a somewhat hardened state. There is no apparent pattern to their placement. The exterior surfaces of A5514032-0001 and A55380230003 are cordmarked and brushed. In the first case, the brushing parallels the cordmarks, and in the second case, the brush marks are basically perpendicular to the cordmarks.

In addition to the cordmarking, there are several other forms of exterior surface treatment. Approximately 38 sherds, including five rim fragments from separate vessels, display smoothed or floated exterior surfaces. Additional forms of treatment, such as polish or incised lines are lacking from these fragments. Slips are discernible on the exterior surfaces of two additional sherds (A55250120002 and A55590130004). In both cases, the slip is very dark gray and does not grade into the underlying paste color.

Parallel, irregularly spaced incisions are present on sherd A55240230019. The object used to produce them is unknown. In addition, incisions are discernible on the necks of three rim sherds (A55130140005, A55000050180 and A55540320010). In the first case, the incisions form three parallel lines which are also parallel to the lip. In the second case, the incisions form inverted "V's" which are oriented on a slight diagonal. The apex of each is at the lip. The third rim fragment exhibits three incised lines which cross each other at various angles close to the lip. These incised lines can be considered decoration. Other forms of decoration, plus lugs and appendages, are absent.

The majority of the sherds lack an indication of intentional smoothing over of the exterior surface treatments.

Floating is the predominant interior surface treatment (Table 5.A1). In some cases, horizontally aligned smoothing lines are present. Several sherds exhibit striations which are probably the result of having been scraped with a firm, smooth tool. One sherd, (A55000050282), has a slip on its interior surface while polishing is present on another specimen (A55320-120001). Indications of brushing followed by floating are present on the interior of sherd A55380230004. The brushing striations are parallel to the cordmarks on the exterior. An unfinished interior surface is present in six sherds from a single, small pot. It is lumpy and lacks any indication of treatment.

Cord description: The cordmarking on the majority of the sherds in the collection was produced by S-twisted cords, approximately 1.25 to 1.75 mm. in width. The predominant orientation of this cordmarking was vertical and parallel. It covered the entire exterior surface and extended up to the lip. The bases of several vessels indicate that the cordmarks tended to criss-cross at the bottom of the vessel.

Thickness: Maximum body thickness was recorded for each sherd in the collection. It ranged from 4.0 to 13.8 mm. and averaged at 7.9 mm.

Rim sherds

Based on the 68 rim fragments recovered from excavations at Two Deer, it is estimated that approximately 45 vessels are represented. The rims are basically straight with flat to slightly rounded lips. The fragments exhibit relative homogeneity and do not depart from the characterization presented above. Additional attributes recorded for the rims further identifies the sample.

Thickness: Lip thickness ranges from 2.0 to 12.0 mm. with a mean of 4.9 mm. Rim thickness averages 7.4 mm. and varies from 5.0 to 16.0 mm.

Rim height: Rim height is measured from the base of the vessel's neck to the lip. It cannot be measured for fragments without necks or from bowls. Rim height for the collection from Two Deer ranged from 8.0 to 56.0 mm., indicating the presence of a variety of pot sizes in the collection (Table 5.6).

Orifice diameter: This attribute could be measured on only 17 (26%) of the rim sherds in the collection. Measurements given in Table 5.6 indicate that both small and large vessels are present.

Vessel form: Three vessel forms are present from the collection. The first, and possibly the more predominant, is a conical vessel exhibiting poorly defined necks, slight shoulders, and elongate bodies. Two conical base fragments and other sherds from the basal area are indicative of the pointed bottoms. Two rim sherds (Fig. 5.13) and fragments from the basal section of a vessel, attest to the presence of a second variety. The more prominent shoulders and constricted necks and orifice, along with the well rounded basal fragments, suggest the presence of globular shaped vessels. Bowls comprise the third form and are represented by only a few specimens.

Table 5.6. Measurements for rim sherds, 14BU55.

Artifact	Lip Thk. (mm.)	Rim Thk. (mm.)	Rim Ht. (mm.)	Orifice Diameter (mm.)
A55130140005	3	5	-	-
A55210140003	5	6	20	-
A55220330001	4	7	25	260
A55220230045	4	5	25	240
A55220210007	5	7	56	-
A55220130009	5	6	-	-
A55220210009	5	10	9	-
A55220120023	12	16	27	-
A55240140001	5	6	18	-
A55240130026	5	10	32	-
A55240240006	6	11	41	170
A55250110002	5	6	11	-
A55250130006	5	8	31	220
A55260110022	4	5	14	110
A55260230012	6	10	-	-
A55260220003	6	7	-	-
A55260220002	3	5	14	-
A55260230015	4	5	-	-
A55270130014	4	5	8	-
A55270210009	6	6	-	-
A55270240017	4	6	-	-
A55270140011	4	6	19	-
A55270130022	6	10	23	150
A55280220002	4	5	-	-
A55280140012	5	10	31	-
A55290230030	5	10	15	-
A55360140002	5	7	22	-
A55380230003	2	7	-	40
A55380220014	5	7	-	-
A55110120005	5	8	25	220
A55260240002	4	7	25	260
A55220240006	4	7	-	-
A55220230032	4	7	-	-
A55220240004	4	5	25	240
A55220240010	4	5	-	-
A55000050180	4	6	16	-
A55270120010	4	5	8	-
A55270130017	4	5	-	-
A55390120002	4	5	-	-
A55410330008	6	7	30	220
A55410340027	5	8	20	220
A55590310001	4	9	23	240
A55590310004	5	9	25	170
A55570240004	6	7	21	170

Table 5.6. (continued)

Artifact	Lip Thk. (mm.)	Rim Thk. (mm.)	Rim Ht. (mm.)	Orifice Diameter (mm.)
A55490320008	5	6	21	-
A55570220010	6	8	26	-
A55410340016	6	8	-	-
A55490320011	6	7	18	-
A55460310004	6	6	-	-
A55410440003	4	7	-	-
A55460310001	6	6	-	-
A55550120005	8	8	12	-
A55430310010	6	6	-	-
A55410340028	5	5	-	-
A55400320002	6	5	-	-
A55540310010	6	7	17	-
A55540310025	3	5	-	60
A55500330001	4	5	9	-
A55420440009	3	6	-	-
Total	61	61	36	17
$\bar{X}$	4.9	7.0	21.5	185.8
s	1.4	2.1	9.6	65.9

Petrographic Analysis and Temper Identification

During the present analysis, approximately 81% of the collection was identified to be bone tempered based on the characteristics described above. Although present in a small sample of sherds from sites in surrounding areas (see Discussion below), bone is not a common or dominant tempering agent in ceramic collections. In particular, no other site in the El Dorado area is known to exhibit bone temper in the pottery. The presence of this inclusion in the assemblage from Two Deer therefore made this collection somewhat unique but also problematic in terms of comparisons to other collections.

A second problem in temper identification concerns the paste matrix and natural inclusions in the clay. Some materials such as hematite, silt and sand grains, and various oxides occur naturally in clays, but are also known to be deliberate tempering agents. When these materials are present in a ceramic collection, the problem arises as to whether they are naturally occurring agents and therefore accidental inclusions, or deliberately added particles.

Figure 5.13. Rim fragments, 14BU55; (a) A55270130022/A55290320002, (b) A55380220014, (c) A55220210007, (d) A55590310004, (e) A55280140012, (f) A55380230003.

In order to further investigate and verify the temper categories, eleven sherds were selected for thin-sectioning and petrographic analysis. These sections were examined under a petrographic microscope by Dr. Marion Bickford, Professor of Geology at the University of Kansas Space Technology Center. The results for each thin section are given in Table 5.7.

The petrographic analysis indicates that the pottery is made of an alluvial clay, as this type of clay has a high quartz content with very little feldspar. With the exception of specimen A55230210017, it is possible that the clay used in the other sherds came from the same source, since similar matrices are indicated. The analysis also supports the identification of bone as the predominant temper. Interestingly, slips are discerned on two sherds which had previously been thought to be unslipped when they were originally examined under the binocular microscope. It is possible that more unrecognized slipped sherds are present in the collection.

Discussion

The examination of 408 sherds from Two Deer indicates that the ceramic assemblage is basically a homogeneous collection. The predominant characteristics are bone tempering, cordmarked exterior surfaces, straight rims with slight shoulders, and long bodies with a concoidal base. Variations from this homogeneity include sherd and clay temper, smoothed, floated exterior surfaces, slightly flaring rims with more prominent shoulders, and shorter bodies with an overall globular shape. In addition, decoration in the form of incised lines is present on a lesser number of fragments.

Classification of the ceramics from Two Deer is somewhat difficult in that the assemblage does not conform completely to types or wares previously defined for eastern Kansas. The ceramics from Two Deer exhibit similarities to the Verdigris and Greenwood types of the Plains Woodland (Early Ceramic) Greenwood phase; to the Pomona ware of the Plains Village (Middle Ceramic) Pomona focus; and to the ceramics recovered from sites of the Bluff Creek complex (Middle Ceramic). However, dissimilarities are also noted to occur between the assemblages. The comparisons made are as follows:

Verdigris type: Originally defined by Calabrese (1967) from his work at the Curry site, Verdigris type pottery is now considered a determinant of the Plains Woodland, Greenwood phase (Reynolds 1979). Pottery of this phase is characteristically tempered with limestone and more rarely with indurated clay, shale, and burned bone. Vessels are cord-roughened and display a wide to slightly constricted orifice with slight shoulders. The lower body is elongate, enlarged, or rounded with a concoidal base (Calabrese 1967). The interior is smoothed and often bears tool or brush marks in a horizontal orientation.

Temporally, the Greenwood phase sites have yielded three radiocarbon dates: A.D. 380±230 from the Curry site (Calabrese 1967); A.D. 550±250 from the Gilligan site; and A.D. 1045±145 from the Two Dog site (Jones and Witty 1980:122). The remaining Greenwood site, Cow Killer, does not have associated radiocarbon dates. The geographical distribution of this Plains Woodland phase includes portions of the east-central section of Kansas in the Verdigris, Osage, and Neosho River drainages. This includes portions of

Table 5.7. Results of petrographic analysis on ceramic fragments, 14BU55.

Specimen	Vessel Section	Temper	Matrix	Comments
A55180340002	body	bone	angular; quartz silt with little feldspar and iron concretions	
A55220230046	body	sherd and bone	angular; quartz silt with little feldspar and iron concretions	
A55220130012	body	bone	angular; mostly quartz with some feldspar	
A55220210004	body	bone	subrounded; mostly quartz with a little feldspar	
A55100330002	body	bone	angular; mostly quartz with very little feldspar and possibly some limonite	
A55230230013	body	bone	angular; mostly quartz with little feldspar and possibly some limonite	silt size particles are aligned parallel to the long dimension of the thin section
A55110220003	body	bone	angular; mostly quartz	particle size is smaller than in the previous specimens; a slip is present on the exterior surface
A55280230009	body	bone	angular; mostly quartz with little feldspar and iron concretions	a slip is present on the exterior surface
A55220230042	body	bone	angular; mostly quartz with little feldspar	
A55230210017	body	absent	fine angular; quartz and feldspar	this is a purer clay than the other specimens
A55000050170	body	limestone	subangular; quartz	

the west-central area of the Osage Cuestas and part of the central portion of the Flint Hills (Jones and Witty 1980).

The Two Deer site, located in south-central Kansas, is probably within the regional distribution of the Greenwood phase. However, with six radiocarbon dates averaging A.D. 1000±25, it falls somewhat later in time. While one late date is known from a Greenwood phase site, the two earlier dates seem to indicate an earlier cultural affiliation than that represented at Two Deer.

Comparison of the ceramic assemblage from Two Deer to the Verdigris type produced both similarities and dissimilarities. The two share such features as cord-roughened exteriors, smooth interiors with tool or brush marks, slight shoulders and an overall concoidal shape. While crushed, burned bone is present as a tempering agent in Verdigris type pottery, it occurs infrequently and sparsely, while at Two Deer, it is abundantly present in over 80% of the collection. Additional dissimilarities are the presence of floated or smoothed exterior surfaces and globular shaped vessels in the Two Deer collection. While neither is represented by large numbers in the collection, their presence is nevertheless significant. On this basis, the ceramics from Two Deer can be said to be similar to the Verdigris type but also displaying enough variations from this type to preclude their classification as Verdigris type ceramics.

Greenwood type: A second pottery type to be associated with the Greenwood phase is the Greenwood type (Jones and Witty 1980:79). It differs from the Verdigris type in its characteristics of indurated clay, shale, or sherd temper; straight to slightly out-curving rims with a constricted orifice; and globular body. Surface treatment consists of cord-roughening on the exterior and the interior showing smoothing and occasional brush marks (Wood 1977:97). These basic characteristics are evident in ceramic assemblages from sites in the Cedar Point Valley of Marion County (Wood 1977) and are considered similar to those defined for Pomona ware of the Pomona focus (Wilmeth 1970). In fact, Reynolds (1979:95) refers to this ware as "Greenwood type of the Pomona focus." If this is presumably a later pottery type, then this may suggest a fairly long time span for the Greenwood phase from approximately A.D. 150 to A.D. 1100. Terminal Greenwood phase would therefore by contemporary with early Pomona and the occupation at Two Deer.

The ceramics from Two Deer also exhibit similarities to Greenwood type. These are basically the globular vessel form, slightly out-curving rims, and cordmarked exteriors. However, dissimilarities are also noticeable. The bone tempering, conical vessels and smoothed exterior surfaces found in the Two Deer collection are not considered characteristic of the Greenwood type. Therefore, despite a tighter temporal association between Greenwood type ceramics and the occupation at Two Deer, the ceramics from this site cannot be considered Greenwood type.

Pomona ware: Originally defined by Wilmeth (1970), this ware is more recently described from the Dead Hickory site (Schmits, Reid and O'Malley 1980) and by Witty (1978), as representative of the Pomona focus. Basically, the ceramics are characterized by a predominance of medium to small sized globular

vessels with cord-roughened exteriors and occasionally, direct or channeled, collar-like rims (Witty 1978:59). The paste is sparsely tempered with indurated clay, sherd, weathered shale, and sometimes, crushed bone. When present, decoration consists of some modification to the vessel lip. Bowls are also present in limited numbers.

Spatially, Pomona focus sites occur in the eastern third of Kansas, mainly south of the Kansas River with the Flint Hills forming the western boundary (Witty 1967). Temporally, this cultural expression spans the period from approximately A.D. 1000 to A.D. 1500. While contemporary with Central Plains tradition complexes, the Pomona focus is thought to represent a late survival of basic Plains Woodland manifestations with some influence from the later Smoky Hill aspect of eastern Kansas (Witty 1978).

Again, a comparison of the ceramics from Two Deer with Pomona ware results in similarities and dissimilarities. Traits shared between the two are globular shaped jars and bowls, cordmarked exterior surfaces and bone temper. In addition, a comparison of the ceramics from Two Deer with a sample of sherds from site 14MM7, an early Pomona site in Miami county, Kansas, indicated no significant differences between the two assemblages. Attributes compared were body thickness, lip thickness, rim thickness, rim height, and rim diameter (Adair 1980). Channeled or collared rims and lip decoration are, however, conspicuously absent from Two Deer. As with Verdigris type pottery, bone temper does not predominate in Pomona ware as it does in the Two Deer collection. Conversely, sherd and clay temper is present but not abundant in the Two Deer ceramics while they dominate in Pomona ware. In addition, no mention is made of Pomona ware exhibiting smoothed exterior surfaces.

Bluff Creek: Burned, crushed bone temper is perhaps most prevalent in sites of the Bluff Creek complex, located in south-central Kansas, in proximity to Anthony, Kansas. This complex dates about A.D. 1050 and shares traits with the Central Plains tradition as well as the Southern Plains Wasita focus (Witty 1978:63).

Ceramics recovered from the Dow Manville site (14HP1), a Bluff Creek complex site, are described as plain or cord-roughened, small to medium globular vessels (Anag 1980). While sand and calcite are the dominant temper inclusions, burned crushed bone is present in a small percent of the sample. Also present are various forms of decoration, such as obliquely incised, parallel lines, fingernail impressions or notches on the lip, and the strap handles. Witty (1978:63) describes additional applique decoration that are typical of the Washita focus.

Similarities between ceramics of the Bluff Creek complex sites and the Two Deer site include bone tempering, smooth and cord-roughened exterior surfaces, and globular shaped vessels. However, these traits are not shared in equal proportions in the two assemblages. Bone tempering is still more prevalent in the ceramics from Two Deer, while smoothed exterior surfaces and globular shaped vessels are much more common in the Bluff Creek complex. In addition, the similarities Bluff Creek shares with the southern Plains are not expressed in the ceramic assemblage from Two Deer.

The ceramics from the Two Deer site share certain traits with ceramics classified as Verdigris and Greenwood types of northeast Kansas, Pomona ware of eastern Kansas, and ceramics from the Bluff Creek complex of south-central Kansas. However, the assemblage cannot be included in any of these four wares. The presence of both cordmarked and smoothed surfaces, globular and conoidal vessels, bowls, a dominance of bone tempering, and incised decorations near the rims precludes its classification with any defined ceramic type in eastern Kansas.

The predominance of bone temper appears to be a major trait exhibited in the ceramics from Two Deer that is not common in other assemblages. It is possible that bone is actually a more common temper element in ceramic assemblages from sites in eastern and central Kansas, but misidentified due to difficulty in recognizing the particles. Gypsum may be mistaken for burned bone, as they appear virtually identical in small pieces (Jones and Witty 1980:86; Wood 1977). Bone temper in sherds from Cedar Point were identifed only by X-ray analysis (Wood 1977:90). However, where bone tempered pottery is now recognized, it has been predominantly associated with sites of Middle Ceramic complexes (Jones and Witty 1980:87), or post-A.D. 1000. Exactly how Two Deer fits into this chronology is both difficult and interesting. Such a discussion, however, should include more aspects of the occupation than just the ceramics and will therefore be included in the final section of this report.

Lithic Assemblage

The following section provides a classification of the lithic assemblage recovered from the Two Deer site. Two reasons prompted a discussion of the surface materials separate from the specimens collected during subsurface excavations; the first being that the surface materials were diagnostic of more than one temporal component. Tools representative of Archaic, Plains Woodland, and Plains Village cultural periods were present in the assemblage. While field observations indicated that these components tended to be spatially separated throughout the field (see Fig. 5.2), a controlled, gridded surface collection was not conducted to determine the actual distribution of these materials. Thus, the surface material was treated as a single large assemblage.

The second reason for the division of surface and subsurface material culture remains was realized during data recovery excavations in 1978 and 1979. Excavations during these two seasons recovered material representative of a single component with no apparent extensive mixing of this material with the diverse surficial debris. As a primary intention of this research is to present and discuss this single manifestation so that its material culture remains may be compared with other assemblages from sites throughout the project area and throughout eastern Kansas, it was separated in analyses from the surface materials.

The lithic collection from the excavations of the Two Deer site consists of chipped stone tools and cores, lithic manufacturing debris, ground stone tools, hearthstones, minerals, and unworked stone (Table 5.8). This section discusses only those materials recovered in the 1978 and 1979 excavations, as the artifacts from the previous investigation have been presented elsewhere (Fulmer 1977).

Table 5.8. Lithic assemblage, excluding flotation material, 14BU55.

Category	Year of Excavation 1975	1978	1979	Total
Hafted biface	1	17	18	36
Non-hafted biface	3	68	61	132
Side-scraper		12	4	16
Disto-lateral scraper		2	7	9
End scraper		1	2	3
Denticulate		5	4v	9
Notch		9	12	21
Perforator/graver		5	4	9
Chopper		2	5	7
Core		17	12	29
Tested cobble		2	3	5
Hammerstone		1	4	5
Retouched flake	1	76	201	278
Retouched chip		78	106	184
Retouched potlid		1	5	6
Retouched shatter		9	34	43
Utilized flake		95	98	193
Utilized chip		105	26	176
Utilized shatter		10	7	17
Chip		2936	3974	6910
Flake		994	1065	2059
Chunk and shatter		2679	2559	5238
Potlid	548*	39	104	143
Worked stone		2	6	8
Unworked limestone		700(5.2kg.)	604(2.5kg.)	1304(7.7kg.)
Unworked sandstone		42(1.6kg.)	25(.85kg.)	257(2.5kg.)
Mineral		4(6.4gm.)	2(5.2gm.)	6(11.6gm.)
Cobbles		11(1.1kg.)	6(.5kg.)	17(1.6kg.)
Weathered chert		50(63gm.)		50(63gm.)

*total amount of debitage

Chipped Stone Tools

This collection of artifacts from Two Deer includes 35 hafted bifaces, 129 non-hafted bifaces, 28 scrapers, 830 edge modified flakes and chips, 7 choppers, 9 gravers and perforators, 30 notches and denticulates, 5 hammerstones, 29 cores, and 5 tested cobbles.

Hafted Bifaces

The 35 artifacts in this collection share the common characteristics of an obvious haft that defines their probable use as arrow or dart points. Morphological characteristics, such as overall size and placement of notches, allow for the recognition of four different category types.

The first and more abundant type, small triangular, corner-notched arrow points, includes 18 specimens. This total is divided into eight complete tools, nine proximal sections, and one midsection fragment. These arrow points are small, symmetrical, and finely pressure flaked. The basic shape consists of an isoceles triangle that converges to a distal point or narrow arc (Fig. 5.14) and displays a thin, lenticular cross-section. Bases vary from straight to slightly convex to slightly concave. The mean continuous measurements for the complete tools are: 21.2 mm. in length; 14.1 mm. in width; 2.7 mm. in thickness; and an average weight of .9 gm. Descriptive data for all of the tools in this category are presented in Table 5.9.

Four of the tools in this category retain characteristics of the flake blank from which they were manufactured. The flake ripple marks on the ventral face of these tools, marred only by marginal edge modification, suggests that these tools were expediently manufactured from small flakes of locally available cherts. This mode of manufacture is somewhat in contrast to the curation and rejuvination processes noted in two other specimens (Fig. 5.14d,e). The rather wide base and short, thick blade of each of these tools suggests that they were at one time larger tools which broke and were subsequently reworked.

The second type of arrow points are characterized as small, triangular side-notched tools. The three artifacts in this category (Fig. 5.15) are similar in continuous measurements to the first type (Table 5.9). However, unlike several specimens in the previous type tools in this category exhibit fine pressure flaked scars on both faces.

The third category, comprised of ten artifacts, are typically thin and triangular in outline. They are either unnotched, display a single shallow notch on one basal corner, or exhibit a slightly restricted stem. Mean continuous measurements for the ten complete tools is: 21.8 mm. in length; 9.8 mm. in width; 2.7 mm. in thickness; and .8 gm. in weight (Table 5.9).

Like those tools of the first type, several of the artifacts in this class retain flake characteristics on the ventral face. In addition, some exhibit marginal edge modification on both faces (Fig. 5.16g,h), again suggesting a rather expedient manner of manufacture. Their use as arrow

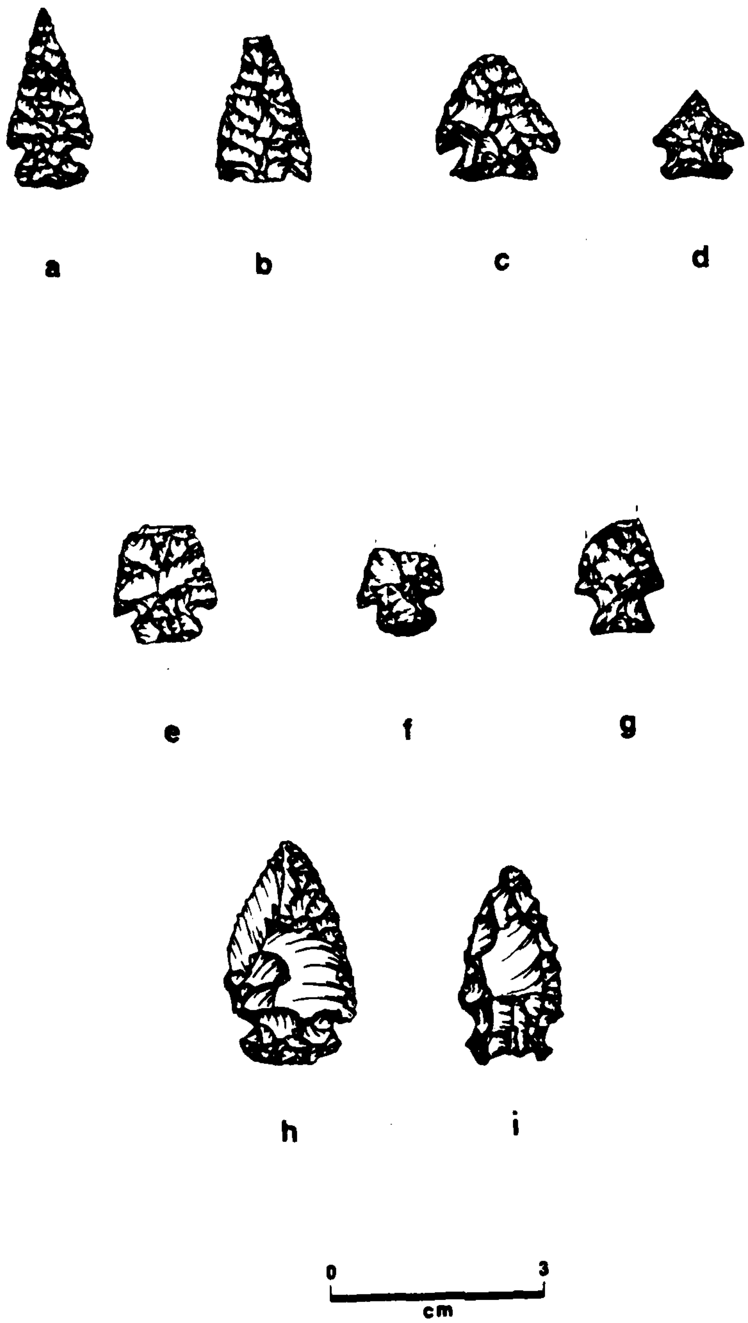

Figure 5.14. Hafted bifaces, type 1, 14BU55; (a) A55380220013, (b) A55380220015, (c) A55270140007, (d) A55560310008, (e) A55270110025, (f) A55440120003, (g) A55450320006, (h) A55270210003, (i) A55250130005.

Table 5.9. Descriptive data for hafted bifaces, 14BU55.

Specimen	Type	Length[1]	Width[1]	Thickness[1]	Weight[2]	Chert[3]	Heat[4]	Stem[1] Length	Stem[1] Width	Basal[1] Width	Notch[1] Opening	Notch[1] Depth
A55380220013	1	25.0	12.0	2.3	.7	1	-	6.0	5.5	10.0	2.8	2.3
A55550410003	1	16.0	9.0	2.0	.5	2	+	4.5	5.0	6.0	3.0	2.0
A55560310008	1	11.9	13.0	2.6	.6	1	+	4.5	8.0	10.5	4.0	2.0
A55250130005	1	27.8	14.1	3.5	1.2	1	-	5.0	10.0	11.0	6.0	2.0
A55270210003	1	31.5	17.3	3.8	1.6	1	-	7.0	11.0	14.0	4.0	2.3
A55270140007	1	17.6	17.0	3.1	1.1	1	+	4.4	9.2	11.6	3.8	3.1
A55420120003	1	21.2	9.7	1.8	.7	2	-	5.0	5.0	7.5	5.0	2.0
A55420420017	1	22.7	14.0	3.2	1.1	2	-	5.3	6.0	8.3	3.0	3.0
A55430340002	1	-	-	3.4	-	1	+	6.0	9.0	12.0	5.6	2.7
A55440120003	1	-	-	2.5	-	1	+	6.0	6.5	8.7	4.0	2.5
A55450320006	1	-	-	2.8	-	2	-	5.5	6.5	9.5	7.0	2.3
A55550330005	1	-	-	2.6	-	1	+	5.0	9.0	10.0	3.0	2.5
A55570120005	1	-	-	2.0	-	1	+	-	-	-	3.5	4.5
A55280220013	1	-	-	2.1	-	2	-	5.5	6.2	9.6	2.9	2.1
A55270110025	1	-	-	2.8	-	1	+	5.6	7.8	9.5	3.5	2.4
A55220220007	1	-	-	2.6	-	2	-	5.3	8.7	12.1	4.3	2.0
A55290210003	1	-	-	3.2	-	2	-	-	-	-	-	-
A55350240001	1	-	-	2.3	-	2	-	-	-	-	-	-
Total		8	8	18	8			15	15	15	16	16
$\bar{X}$		21.7	13.8	2.7	.9			5.3	7.7	10.0	4.2	2.5
s		6.4	3.6	.5	.4			.7	1.8	2.1	1.2	.7
A55270120025	2	19.0	11.7	2.4	.6	1	+	5.8	5.9	9.9	3.3	2.1
A55470330002	2	21.9	12.0	3.0	1.0		+	-	7.0	-	2.0	2.5
A55440220005	2	32.0	16.0	2.7	1.8	2	-	6.5	12.0	16.0	3.5	2.5
Total		3	3	3	3			2	3	2	3	3
$\bar{X}$		24.3	13.2	2.7	1.1			6.1	8.3	12.9	2.9	2.3
s		6.8	2.4	.3	.6			.5	3.2	4.3	.8	.2

Table 5.9. (continued)

Specimen	Type	Length[1]	Width[1]	Thickness[1]	Weight[2]	Chert[3]	Heat[4]	Stem[1] Length	Stem[1] Width	Basal[1] Width	Notch[1] Opening	Notch[1] Depth
A55390240010	3	19.2	9.3	2.7	.6	1	+					
A55230140001	3	21.7	9.3	2.2	.6	1	-					
A55220130006	3	20.0	9.2	3.3	.6	2	-					
A55550120004	3	16.0	8.6	2.3	.6	1	+					
A55430340009	3	17.6	11.8	2.6	1.0	1	+					
A55590320001	3	31.7	12.8	3.7	1.7	1	+					
A55400320013	3	25.6	7.7	2.6	1.0	2	-					
A55420440011	3	22.0	9.5	2.4	.8	1	-					
A55410320013	3	29.5	9.2	2.6	1.0	1	+					
Total		10	10	10	10							
$\bar{X}$		21.8	9.8	2.7	.8							
s		5.5	1.5	.4	.3							
A55210320001	4	-	-	4.6	3.0	1	+					
A55260140008	4	-	-	5.1	5.1	1	+					
A55270210004	4	-	-	6.5	8.4	2	-	13.0	16.0	26.5	13.0	5.5
A55280240006	4	62.3	33.8	7.4	13.5	1	+	15.0	22.5	33.0	6.0	6.0

[1]measurements in mm.
[2]weight in gm.
[3]1=Florence A, 2=Florence B, 3=Flint Hills light gray, 4=Flint Hills green, 5=unknown
[4]+=present, -=absent

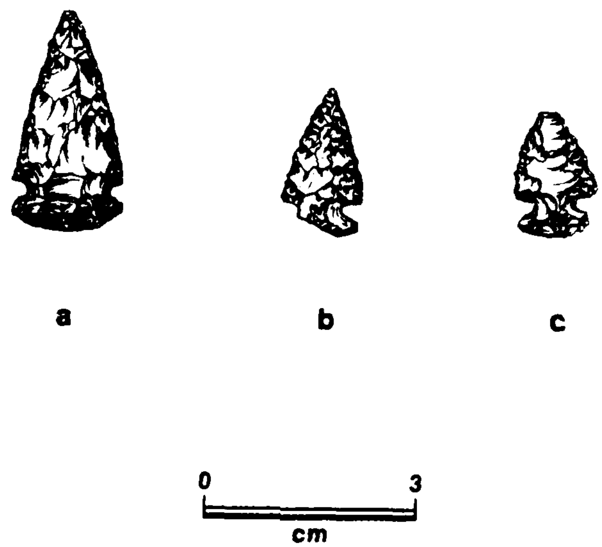

Figure 5.15. Hafted bifaces, type 2, 14BU55; (a) A55440220005, (b) A55470330002, (c) A55270120025.

points is ascertained by the presence of impact fractures on the point of several tools, as illustrated in Figure 5.16c.

The final category of hafted bifaces from Two Deer is comprised of four tools which may be more appropriately labeled dart points. Although they vary considerably among themselves, these tools are two to three times larger than the small arrow points (Table 5.9). They range in outline from triangular to straight sided (Fig. 5.17) with both convex and straight bases. One specimen is severely damaged from exposure to heat, two exhibit lateral snaps, and the fourth artifact is complete. The function of the complete artifact is somewhat questionable, however, since it is hafted upside-down (Fig. 5.17a). The notches on this specimen are oriented toward the base rather than the distal point.

Non-hafted bifaces

The criteria for placement of tools in this group were the presence of invasive flake scars on at least one surface, the absence of a manufactured haft, and lateral working edges which converge to a distal point or narrow arc. The basic shape varies from a subtriangular outline with a thin lenticular cross-section to a more ovate form and plano-convex in outline.

A total of 129 tools and fragments are included in this category, of which 37 are complete or nearly complete. Two of the complete artifacts are cross-mended tools. The total can be further divided into four categories

or types on the basis of overall size, shape, and amount of secondary retouch. Descriptive data for complete tools in all categories are found in Table 5.10.

The first category of non-hafted bifacial tools consists of 31 complete specimens, 32 distal fragments, 26 proximal sections, 7 medial fragments, 5 lateral portions, and 14 small and undiagnostic edge fragments. While they vary somewhat in size and shape (Fig. 5.18), the complete tools share several similarities such as overall symmetry, fine pressure flaked scars, well rounded or worn distal tips, and considerable edge smoothing of the proximal end. Mean continuous measurements for the complete tools are; length 33.6 mm., width 18.9 mm., thickness 4.6 mm., and weight 3.2 gm. It

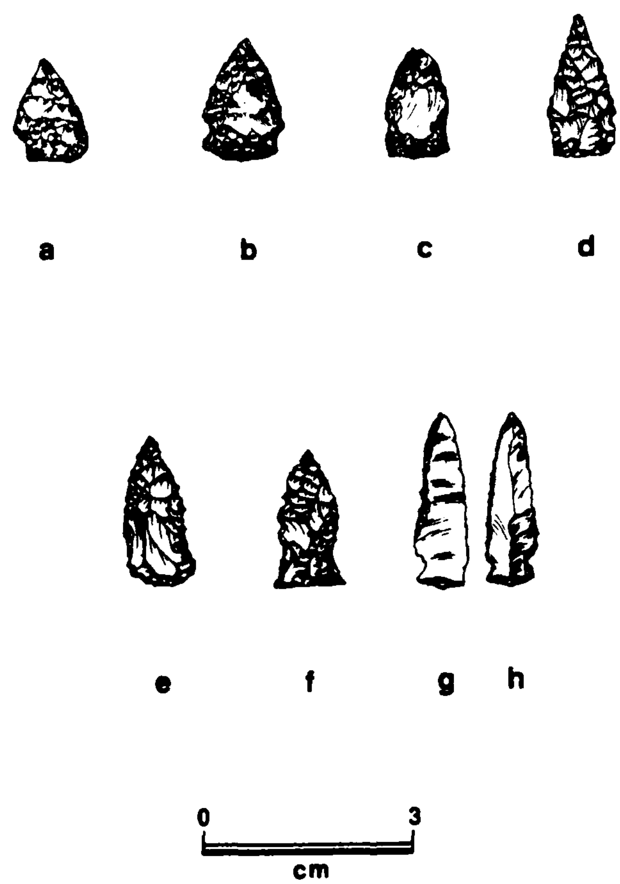

Figure 5.16. Hafted bifaces, type 3, 14BU55; (a) A55470240002, (b) A55430340009, (c) A55550120003, (d) A55220130006, (e) A55230140001, (f) A55390240010, (g) A55400320013, ventral face, (h) dorsal face.

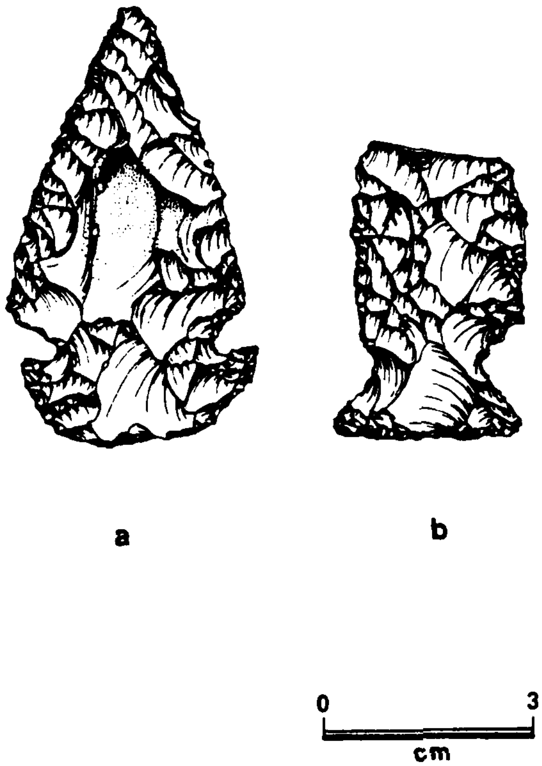

Figure 5.17. Hafted bifaces, type 4, 14BU55; (a) A55280240006, (b) A55270210004, (c) A55210320001.

is also interesting to note that all but three tools in this category were manufactured from locally available Florence A chert and only four of these do not exhibit distinctive signs of thermal alteration (Table 5.10).

Eight of the complete tools in this category share a somewhat unique characteristic similar to that found on several of the hafted bifaces. These tools exhibit invasive modification on the dorsal face only, with modification of the ventral face being limited to the edge (Fig. 5.18i,j). Again, it can be suggested that these tools were rather quickly manufactured from a small, thin, flake blank. Bifaces which exhibit invasive modification on both faces were probably also manufactured from flake blanks. Basal thinning noted on one specimen (Fig. 5.18c), is the result of platform preparation for the removal of the flake blank.

The second category of bifacial tools are perhaps more accurately labeled preforms. However, it is not always possible, using morphological characteristics, to distinguish between a preform and a completed tool. While a preform

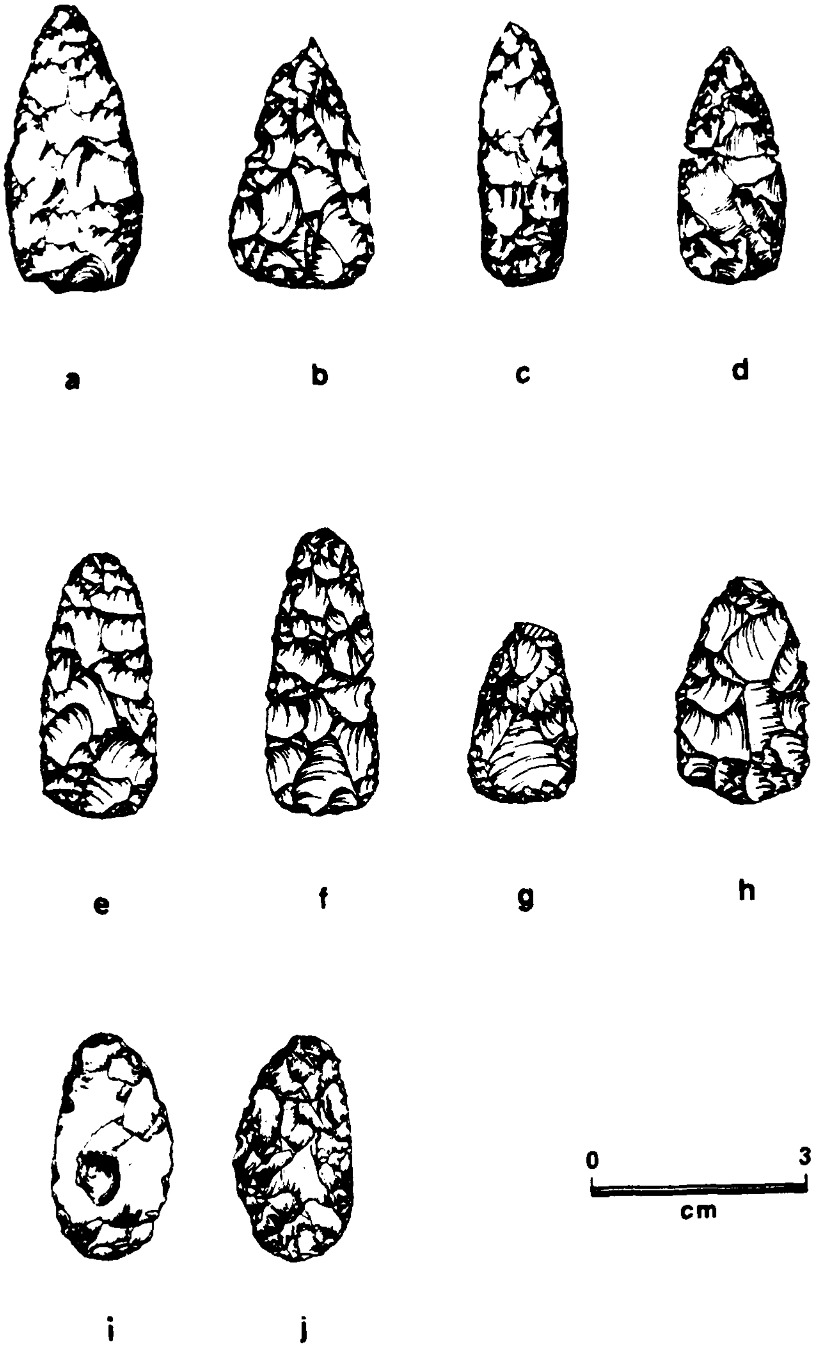

Figure 5.18. Non-hafted bifaces, type 1, 14BU55; (a) A554903212, (b) A55270240004, (c) A55490229991, (d) A55270210002/A55270110027, (e) A55390210002, (f) A55390220033/A55200140001, (g) A55250110004, (h) A55200330001, (i) A55390220035 ventral face, (j) dorsal face.

Table 5.10. Descriptive data for complete non-hafted bifaces, 14BU55.

Specimen	Type	Length[1]	Width[1]	Thickness[1]	Weight[2]	Chert[3]	Heat[4]	Edge angle
A55430340013	1	42.0	16.1	5.5	3.8	1	+	35
A55430410003	1	34.9	18.6	3.7	3.0	1	+	32
A55430330008	1	35.6	22.7	5.3	4.0	1	+	38
A55460320016	1	38.2	21.3	3.7	4.0	1	+	29
A55460310009	1	32.9	16.7	5.5	2.7	1	-	30
A55460310007	1	46.5	19.6	6.0	5.3	1	+	34
A55390210027	1	34.5	20.6	5.6	3.5	4	+	36
A55270130013	1	27.0	21.9	6.2	3.4	1	+	33
A55490320012	1	42.3	20.9	2.0	4.9	1	+	25
A55390210002	1	38.7	16.6	4.6	2.5	1	+	27
A55420330001	1	42.8	19.2	3.3	3.6	4	+	36
A55400230002	1	23.0	19.6	4.8	3.0	1	+	45
A55400310009	1	28.8	19.2	6.4	3.5	1	+	38
A55430410002	1	30.2	19.1	3.0	2.4	1	+	27
A55240110002	1	26.5	21.3	5.0	2.9	1	+	32
A55270240004	1	34.9	20.0	4.7	3.0	1	+	33
A55390220032	1	27.0	19.9	3.6	2.1	1	+	30
A55390230012	1	28.9	16.7	4.8	2.3	1	+	38
A55390220035	1	33.0	17.6	3.6	2.2	1	-	34
A55470340007	1	31.9	17.7	5.6	3.5	5	-	31
A55250110004	1	25.6	15.4	4.4	1.5	1	+	30
A55540410010	1	41.1	18.9	7.0	5.0	1	-	41
A55490220001	1	38.6	13.2	3.8	2.7	1	+	31
A55560330007	1	27.8	21.5	4.8	3.6	1	+	31
A55200140001	1	41.0	16.0	2.1	2.4	1	+	34
A55390210021	1	42.7	21.8	5.3	4.8	1	+	41
A55220230174	1	29.9	16.2	4.0	1.8	1	+	29
A55390220034	1	24.8	15.1	3.4	1.2	1	+	27
A55560330012	1	30.0	22.8	5.4	4.0	1	+	40
A55420420011	1	30.0	22.0	5.0	5.3	1	+	31
A55200330001	1	32.9	18.3	5.9	3.0	1	+	34
Total		31	31	31	31			31
$\bar{X}$		33.6	18.9	4.6	3.2			33.4
s		6.3	2.5	1.2	1.1			4.8

Table 5.10. (continued)

Specimen	Type	Length[1]	Width[1]	Thickness[1]	Weight[2]	Chert[3]	Heat[4]	Edge angle
A55200120005	2	49.9	24.8	5.7	7.2	1	+	35
A55550220002	2	43.7	23.6	9.0	9.1	1	-	48
A55390220036	2	44.3	31.4	12.7	14.2	1	+	41
A55490320010	2	36.3	23.2	7.6	6.0	1	+	35
Total		4	4	4	4			4
$\bar{X}$		43.5	25.7	8.8	9.2			39.7
s		5.6	3.8	3.0	3.6			6.2
A55390210022	3	82.0	36.5	8.3	14.2	1	+	
A55240130004	3	44.0	25.5	5.3	4.8	1	-	
A55420420015	4	139.5	52.0	29.0	177.5	3	+	76

[1]measurements in mm.
[2]weight in gm.
[3]1=Florence A, 2=Florence B, 3=Flint Hills light gray, 4=Flint Hills green, 5=unknown
[4]+=present, -=absent

may lack the fine secondary retouch found on other tools, it may have, nevertheless, functioned as a complete tool. However, for purposes of this chapter, nine bifacial tools and fragments were placed into a separate category on the basis of the presence of one or more remnant striking platform of the original blank on the margin of the tool, such as seen in Figure 5.19a (note arrow). Tools in this category share similarities to the previous category in their subtriangular outline and lenticular cross-section. However, they tend to be much thicker (mean of 8.8 mm.) (Table 5.10) and often display a considerable amount of cortex (Fig. 5.19a,b). Fine, secondary retouch along the margin of these tools is almost completely lacking.

Four specimens comprise the third category of non-hafted bifacial tools. Three of these tools are illustrated and descriptive data are provided in Table 5.10. One complete tool (Fig. 5.20a) exhibits one transverse working edge and one convex lateral working edge; the latter being slightly beveled and showing numerous areas of edge smoothing. The tool is manufactured from local Florence A chert with the red color indicating exposure to a heat source.

An incomplete tool (Fig. 5.20b) is a heavy-duty tool manufactured from unheated Florence A chert. Primary flake scars are irregular and secondary flaking is limited to primarily the basal area. This tool exhibits a lateral snap and was not reworked after breakage. The overall large size of this tool makes it a possible candidate for use as a hoe or digging tool. According to ethnographic accounts, tools of this size and shape were frequently hafted and used to prepare the ground for planting or similar activities. Although no polish is observable on the margins of this artifact, other signs of wear from these activities (Keeley 1980) may be present but were not macroscopically visible and therefore not analyzed for this study.

One complete biface in this category exhibits transverse rather than converging lateral working edges (Fig. 5.20c). This tool is ovate in outline and has been finely modified along the margins. It is one of the few tools in the collection from Two Deer that is manufactured from a non-thermally altered blank of Florence A chert.

The remaining tool in this category is a proximal section of a long, thin bifacial tool (not illustrated). In its present condition, it measures 61.0 mm. in length, 27.0 mm. in width, and 6.0 mm. in thickness. One lateral edge has been finely beveled and the tip exhibits an impact fracture.

The final category of non-hafted bifaces is represented by one large complete celt (Fig. 5.21). Manufactured from El Dorado light gray chert, this tool exhibits a subtle pinkish discoloration on the distal end, suggesting at least a portion of the tool was exposed to a heat source. Fine, secondary retouch is visible only on this portion of the tool. The lateral edges of this specimen display heavy utilization, as evinced by step fractures and crushing. Such wear is indicative of the use of the tool in chopping functions (Hester _et al_. 1976; Keeley 1980). Macroscopic wear marks are not visible on the basal portion of this celt. Continuous measurements for this tool are presented in Table 5.10.

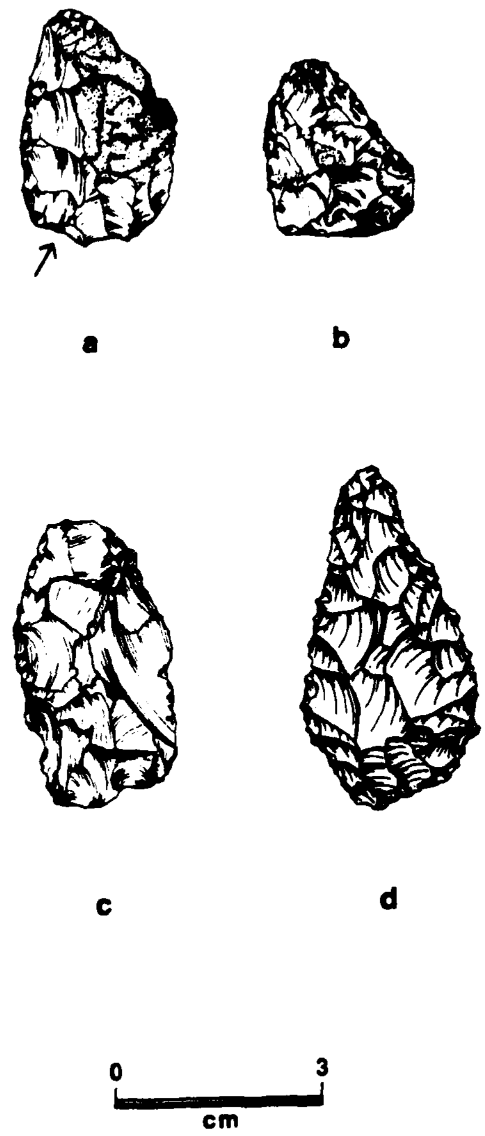

Figure 5.19. Non-hafted bifaces, type 2, 14BU55; (a) A55490320010, (b) A55240110002, (c) A55550220002, (d) A55200120005.

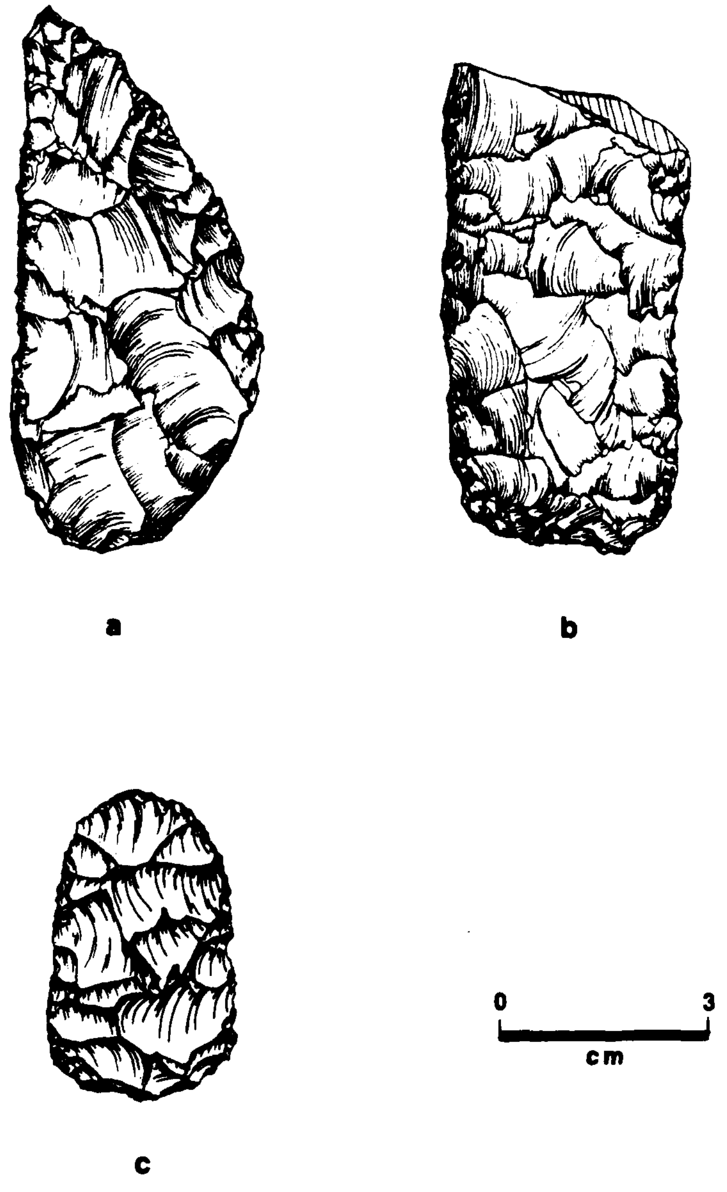

Figure 5.20. Non-hafted bifaces, type 3, 14BU55; (a) A55390210022, (b) A55190230001, (c) A55240130004.

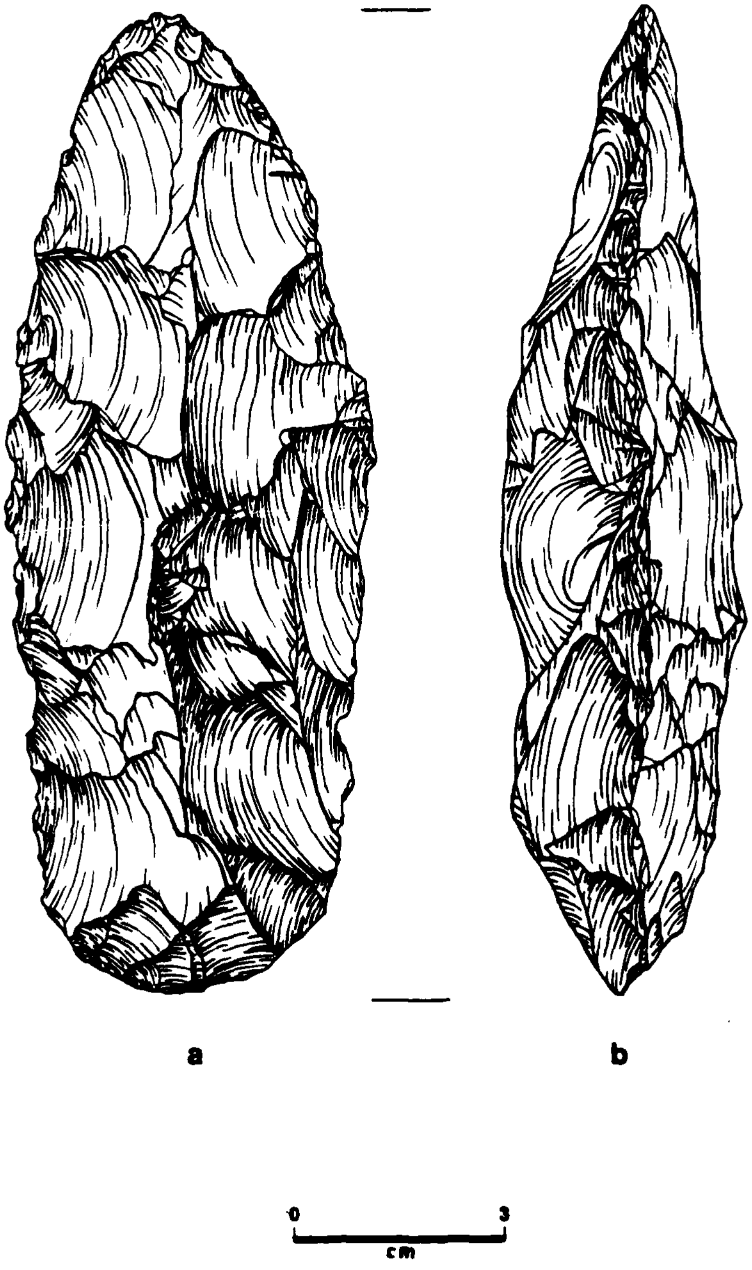

Figure 5.21. Celt, 14BU55; (a) A55420420015, plan view, (b) lateral view.

Scrapers

The morphological characteristics of tools in this group include modification usually restricted to the margins of the tool on one surface. Variations in the amount and placement of the retouch identifies the working edge of the tool and further subdivides this tool type into end scrapers, side scrapers, and disto-lateral scrapers.

Three end scrapers from Two Deer were manufactured from Florence A chert, one thermally altered. The retouch is subinvasive on the dorsal surface only which produces a steep working edge (Fig. 5.22) of approximately 80°. In all specimens, the ventral face is unflaked and the tool exhibits a lateral snap below the bulb of percussion. One tool illustrated (Fig. 5.22c), exhibits heavy utilization on the transverse edge in the form of step fractures. According to experimental evidence (Tringham et al. 1974), this form of wear results from the use of the tool on hard, resistant materials, such as wood, bone, or antler. Descriptive data for these specimens are found in Table 5.11.

Nine scrapers recovered from excavations exhibit continuous modification on both the lateral and transverse edges of flake blanks and are subsequently classified as disto-lateral scrapers. Some of these specimens may be more accurately labeled circular scrapers (Fig. 5.22d,e,f), as the tools are nearly circular and do not exhibit a long or short axis. The ventral surface on all tools in this category is unflaked, except for modification resulting from the reduction of the flake's bulb of percussion evinced on one specimen. Marginal retouch is present on all edges of the tools' dorsal surfaces (Fig. 5.22) with the interior of the tool left unworked. Edge angles vary from 44° to 62° (Table 5.11).

With the exception of two scrapers, all disto-lateral scrapers are manufactured from locally available Florence A chert. One exception is made of Florence B chert, the other of Flint Hills light gray. Neither of these specimens shows signs of thermal alteration, while all but one of the Florence A specimens have been subjected to heat. Descriptive data for tools in this category are presented in Table 5.11.

The final category of scrapers from Two Deer includes 16 complete and fragmented side scrapers. All tools in this group exhibit one or two marginally modified lateral edges. Retouch is restricted primarily to the dorsal surface although four tools exhibit alternatively modified lateral edges (Fig. 5.23). Descriptive data for these side scrapers, presented in Table 5.11, indicates that both small chips and larger primary decortication flakes were selected for manufacture of these tools. Interestingly, unlike the disto-lateral scrapers, blanks of several different chert types were selected and were seldom thermally altered before the lateral edges were modified. Edge angles of these tools vary from 50° to 70° and average about 62°.

Notches and Denticulates

Tools assigned to the category of notch exhibit a single concavity along the edge produced by marginal retouch. The 21 specimens in this group

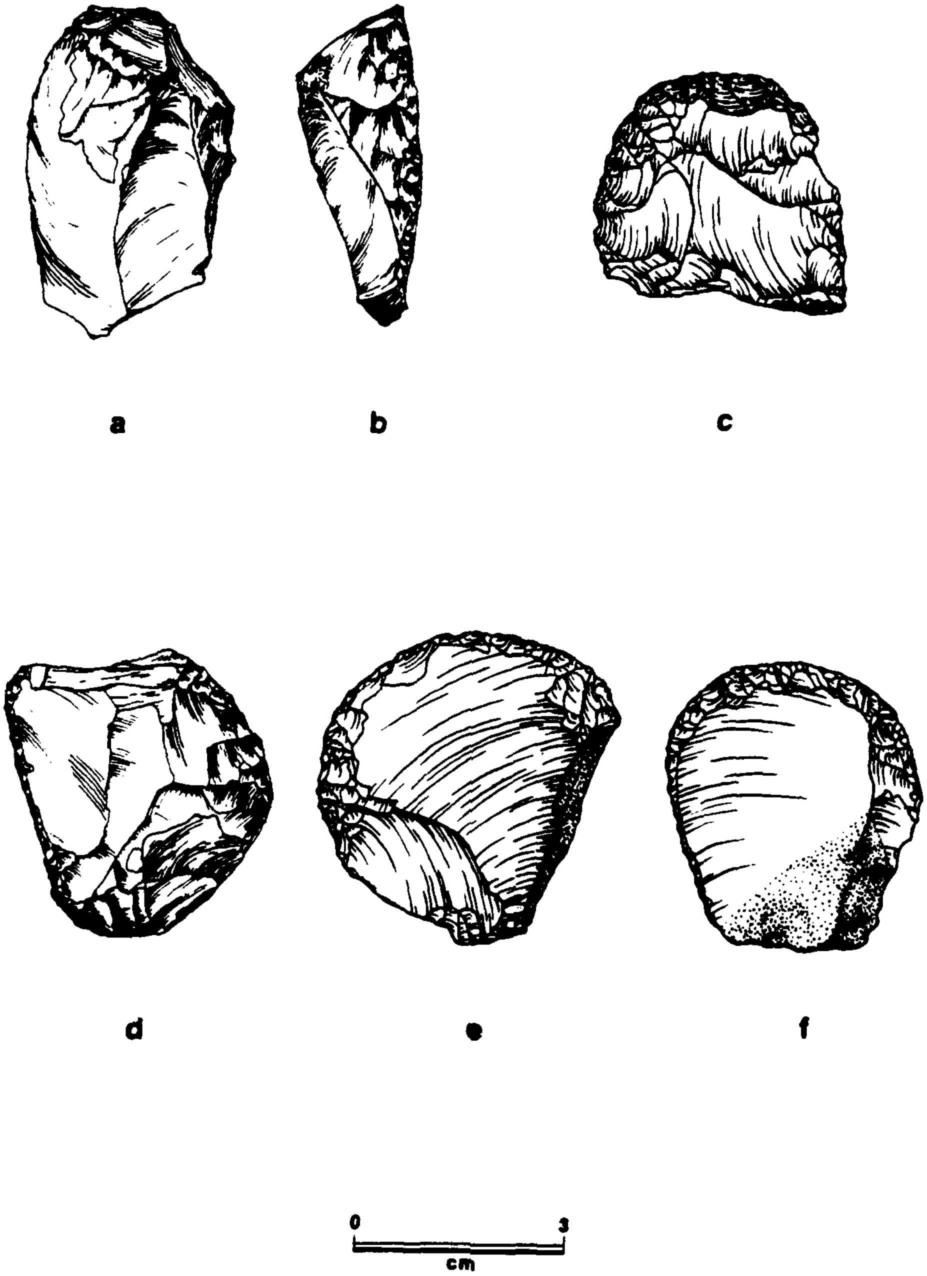

Figure 5.22. End scrapers; (a) A55110110001 plan view, (b) lateral view, (c) A55540410005 and disto-lateral scrapers, (d) A55140110008, (e) A55590340002, (f) A55590340006, 14BU55.

Table 5.11. Descriptive data for scrapers, 14BU55.

Specimen	Utilized Portion	Length[1]	Width	Thickness	Weight[2]	Chert[3]	Heat[4]	Edge Angle	Condition[5]
A55390210013	side	20.6	10.4	2.2	.5	1	+	50	1
A55220230014	side	92.6	37.2	21.1	89.3	2	-	69	1
A55390230011	side	110.8	47.9	20.7	109.2	1	+	55	1
A55110310003	side	16.2	11.5	2.1	.7	2	-	58	3
A55220230003	side	17.7	8.4	2.2	.6	2	-	68	3
A55230130002	side	17.2	9.5	2.7	.6	2	-	56	4
A55130130002	side	22.7	17.0	2.4	9.7	1	-	61	1
A55270140005	side	40.0	36.3	4.5	12.8	4	-	59	1
A55390240008	side	33.5	22.4	4.2	10.5	1	-	55	4
A55470230003	side	62.0	30.0	12.0	15.8	2	-	62	1
A55420310003	side	30.0	15.0	4.0	9.8	1	+	68	1
A55410340047	side	24.3	22.0	7.0	9.3	1	+	70	2
A55570240002	side	28.5	30.5	10.0	13.5	1	+	70	2
A55400210003	side	23.0	14.7	2.5	9.6	1	+	66	2
A55540340006	side	13.5	12.0	2.0	7.5	1	+	60	3
A55110110001	end	48.5	31.0	18.0	67.4	2	-	73	1
A55540410005	end	33.0	35.0	8.0	15.6	1	+	80	2
A55460310014	end	53.6	37.0	11.5	23.8	2	-	78	2
A55140110008	d-1	41.2	36.7	8.3	14.5	3	-	60	3
A55250120010	d-1	21.6	12.9	2.5	1.2	1	+	62	1
A55570310003	d-1	43.0	27.0	3.0	13.5	1	+	46	
A55590340006	d-1	42.0	37.5	4.5	14.8	1	-	60	1
A55400330001	d-1	30.0	27.0	3.5	12.3	1	+	44	1
A55420330005	d-1	28.5	25.0	4.5	15.2	2	-	55	
A55590330001	d-1	36.0	30.0	2.8	10.2	1	+	53	1
A55590340002	d-1	43.6	44.0	6.0	21.5	1	+	58	1
A55420330010	d-1	12.0	17.0	3.0	8.5	1	+	52	
A55540320010	d-1	31.0	26.0	10.0	13.5	1	-	60	1

[1]measurements in mm.
[2]weight in gm.
[3]1=Florence A, 2=Florence B, 3=Fling Hills light gray, 4=Flint Hills green, 5=unknown
[4]+=presence, -=absence
[5]1=complete, 2=medial, 3=proximal, 4=distal

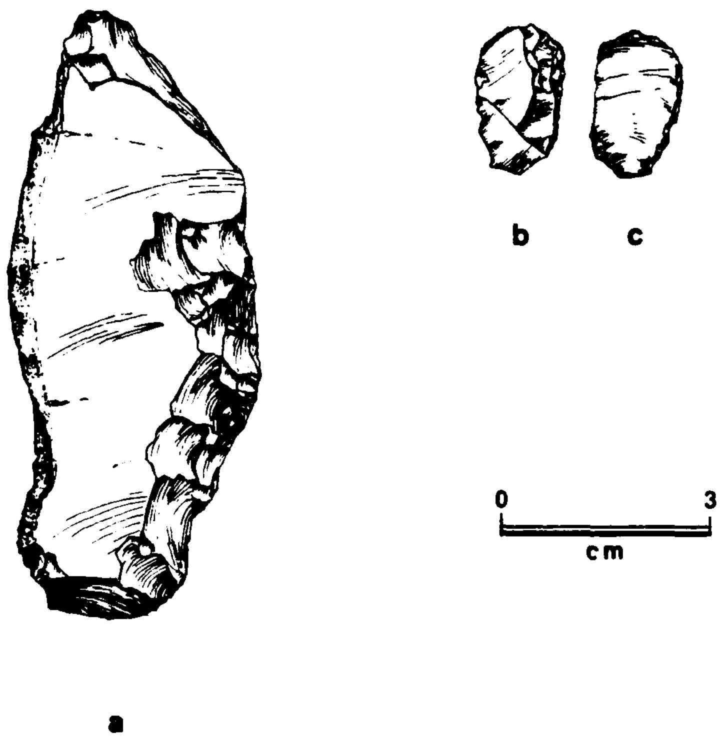

Figure 5.23. Side scrapers, 14BU55; (a) A55220230014, (b) A55250120010, dorsal face, (c) ventral face.

have been manufactured from either flake or chip blanks, several of the larger flakes being primary decortication flakes. With the exception of two small tools made on non-thermally altered Florence B chert, all notched tools have been manufactured on flakes of Florence A chert. Eleven of these display signs of exposure to heat. One specimen has been severely altered by heat, as evidenced by the numerous thermoclastic damage scars, such as an overall heat discoloration and cracked and potlidded dorsal surface. The three tools made on decortication flakes have not been thermally altered. Descriptive data for tools with notched and denticulated edges are presented in Table 5.12.

The category denticulate differs from the preceding by the presence of two or more consecutive notches along the edge (Fig. 5.24). The nine tools in this category have been manufactured from flake blanks; five from thermally altered Florence A flakes. Two of the remaining tools are made from flakes of Florence B chert, another from a flake of Flint Hills light gray chert, and the remaining tool from an unknown, possibly non-local, chert flake.

Table 5.12. Descriptive data for nothces and denticulates, 14BU55.

Specimen	Length[1]	Width	Thickness	Weight[2]	Chert[3]	Heat[4]	Edge angle	Condition[5]
Notch								
A55260210010	55.7	60.2	17.5	46.9	4	-	65	2
A55180320001	25.0	17.5	5.2	7.0	1	+	60	4
A55390210003	43.6	24.0	6.5	3.5	1	-	58	1
A55380220009	9.8	19.4	3.2	.6	1	+	60	1
A55210120005	17.9	11.6	2.2	.9	1	+	65	1
A55250120008	13.0	10.0	2.1	.4	2	-	55	3
A55390220007	10.5	11.0	2.0	.4	1	+	57	1
A55360140001	38.0	17.0	4.0	7.8	1	+	60	1
A55210130004	34.0	28.5	5.0	12.5	1	+	60	1
A55400330024	47.5	44.0	17.8	35.8	1	-	67	2
A55490120002	36.0	38.0	8.0	15.6	1	+	68	1
A55590230001	34.5	27.0	8.0	14.3	1	+	68	3
A55490320002	34.0	24.0	5.8	12.0	1	-	56	1
A55480130001	35.0	14.5	4.5	9.0	1	+	65	1
A55400340004	30.4	15.0	6.3	11.5	2	-	-	3
A55480140003	27.0	24.0	6.2	12.3	1	+	68	1
A55450140001	31.2	16.5	4.0	9.2	1	+	67	1
A55420320042	25.0	32.0	4.3	9.5	1	+	66	1
A55560310009	31.0	27.0	2.5	8.5	1	+	70	1
A55570240012	14.0	13.0	2.0	6.3	1	+	70	1
A55400230008	16.0	10.0	3.0	8.0	1	+	58	3
Denticulate								
A55430140002	16.3	21.0	3.2	14.5	1	+	50	1
A55460120002	21.3	20.0	2.0	15.3	1	+	57	1
A55420420013	24.5	14.6	3.2	9.8	1	+	63	1
A55420330015	22.0	16.8	2.0	9.8	1	+	52	3
A55190140003	18.6	33.7	9.1	14.9	1	-	60	2
A55390230010	47.6	26.2	5.0	17.3	4	+	63	1
A55360110001	29.0	14.7	3.5	11.6	4	-	70	1
A55270130007	32.6	15.0	3.4	11.8	2	-	49	1
A55200220005	36.0	30.0	4.3	14.2	3	-	60	3

[1]measurements in mm.
[2]weight in gm.
[3]1=Florence A, 2=Florence B, 3=Flint Hills light gray, 4=Flint Hills green, 5=unknown
[4]+=presence, -=absence
[5]1=complete, 2=medial, 3=proximal, 4=distal

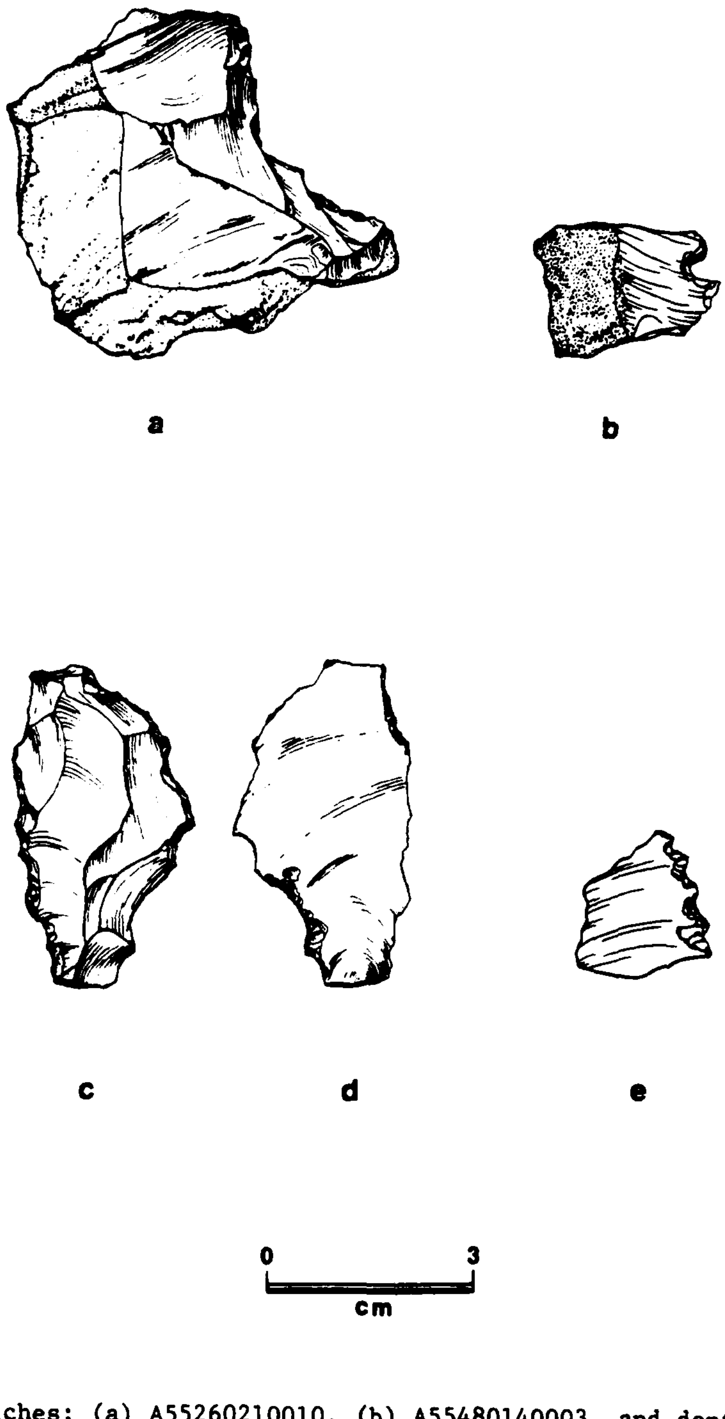

Figure 5.24. Notches; (a) A55260210010, (b) A55480140003, and denticulates, (c) A55390230010, dorsal face, (d) ventral face, (e) A55430140002.

Figure 5.25. Chopper, 14BU55; A55270110035.

Several notched or denticulated tools exhibit additional modification along one lateral edge, usually opposite the working edge. This intentional retouching may have served to blunt the edge to facilitate prehension. Cortical surfaces, evident on eight notched and two denticulate tools, may have also facilitated prehension by serving as a natural backing.

Chopper

Seven tools in the assemblage from Two Deer exhibit evidence of utilization in a heavy chopping function. All tools display an original hydration patinated surface, suggesting they were manufactured from alluvial cobbles. Modification consists of the removal of flakes along the transverse edge to form a crude, biclinal edge (Fig. 5.25). The working edges show extensive wear such as heavy crushing and step faceting, indicative of use on hard, fairly resistant materials (Tringham et al. 1974).

Five of the seven chopping tools have been manufactured from cobbles of Florence A chert; all show signs of exposure to heat sources. Non-heated Florence B chert is the raw material source for the two remaining tools. Descriptive data for these tools are available in Table 5.13.

Perforators

Manufactured from small flakes of Florence A chert are nine tools whose characteristic shape suggests their use in perforating or graving functions. Steep marginal or subinvasive modification has resulted in a protruding working edge that is angular to rhombodial in cross-section (Fig. 5.26). Modification on the rest of the flake is restricted primarily to the dorsal surface, with the ventral surface retaining flake characteristics from the original blank. Additional modification along one lateral edge evidenced on three specimens, suggests that intentional retouch may have been produced to facilitate prehension of these tools. Descriptive data, presented in Table 5.14, indicates little variation among these tools' continuous measurements.

Table 5.13. Descriptive data for choppers, 14BU55.

Specimen	Length[1]	Width	Thickness	Weight[2]	Chert[3]	Heat[4]
A55410430014	38.0	40.0	22.0	40.5	1	+
A55400230014	38.0	33.5	12.0	14.5	1	+
A55100430001	43.0	35.0	18.7	29.0	1	+
A55270110035	45.5	46.0	23.0	48.0	1	+
A55480340008	59.0	66.0	20.0	79.0	1	+
A55400310016	42.0	58.0	23.0	66.7	2	-
A55550320010	51.0	52.0	17.0	56.5	2	-
Total	7	7	7	7		
$\bar{X}$	45.2	47.2	19.4	47.7		
s	7.5	12.1	3.9	22.1		

Table 5.14. Descriptive data for perforators, 14BU55.

Specimen	Length[1]	Width	Thickness	Weight[2]	Chert[3]	Heat[4]
A55190310001	30.0	10.7	3.1	1.1	1	+
A55190110001	32.8	16.8	3.8	2.9	1	+
A55220130005	20.8	22.0	8.4	5.4	1	+
A55410310014	24.0	9.0	2.0	.9	1	-
A55400220005	20.0	10.7	6.0	1.6	1	-
A55240120003	25.5	11.4	4.5	1.1	1	+
A55250120011	24.5	12.1	4.7	1.4	1	+
A55550340004	30.6	20.0	7.0	4.7	1	+
A55420420010	24.0	10.5	2.3	1.8	1	+
Total	9	9	9	9		
$\bar{X}$	25.8	13.6	4.6	2.3		
s	4.4	4.6	2.1	1.6		

[1]measurements in mm.
[2]weight in gm.
[3]1=Florence A, 2=Florence B, 3=Flint Hills light gray, 4=Flint Hills green, 5=unknown
[4]+=presence, -=absence

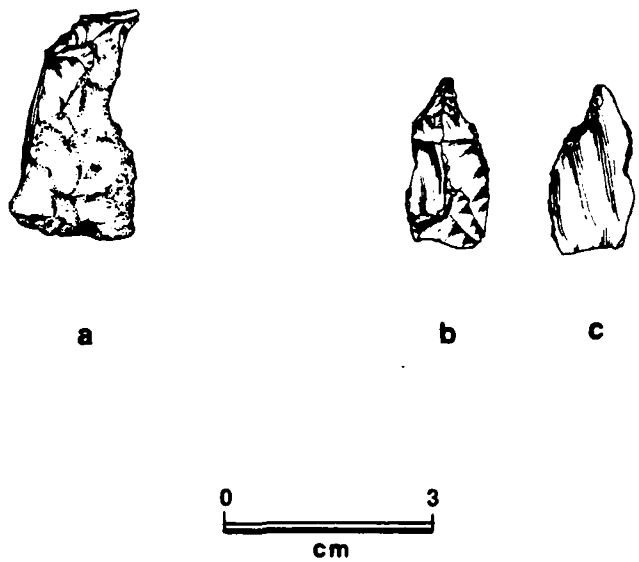

Figure 5.26. Perforators, 14BU55; (a) A55190110001, (b) A55250120011, dorsal face, (c) ventral face.

Cores and Tested Cobb`

The production of flakes from cores is directly evidenced by the recovery of numerous cores, core fragments, and tested cobbles from the Two Deer site. Unlike a single well-prepared blade core recovered from the surface of this site, the 30 cores from excavations exhibit a random flake removal pattern with little or no preparation or shaping. A single platform is present on most of these artifacts (Table 5.15) while over half of the specimens lack indications of exposure to heat. Of the 11 that do appear to have been thermally altered, six are core fragments, suggesting that the thermal alteration of large chert blanks, procurred for the initial reduction of lithic raw materials, was not a prevalent technological activity at Two Deer.

Descriptive data, presented in Table 5.15, indicates a variety of sizes among the cores and core fragments. While single-ended cores predominate, both polymorphic and discoidally shaped specimens are present. In addition, one large core (Fig. 5.27) appears to have been modified by rejuvination. One entire platform, along with portions of the negative flake scars associated with this platform (marked by arrow in Fig. 5.27), has been removed, leaving an unaltered surface which could serve as an alternative striking platform. This new platform, however, does not evince signs of much use. Instead, another platform (marked by two arrows in Fig. 5.27) appears to have been used quite extensively before the core was discarded.

Table 5.15. Descriptive data for cores, tested cobbles, and hammerstones, 14BU55.

Specimen	Weight	Chert	Heat	Cortex	Battering	No. of Platforms
Cores						
A55270130012	356.0	2	-	+	+	?
A55230120039	69.4	1	-	+	-	1
A55230220032	45.0	3	-	+	-	2
A55260240025	49.5	2	-	-	-	1
A55250130008	47.2	1	+	-	-	2
A55280210006	31.4	1	+	+	-	1
A55200230006*	29.2	1	+	+	-	1
A55270110044	30.3	2	-	+	-	1
A55390220027*	19.2	1	+	+	-	1
A55200240004*	28.0	1	+	-	-	?
A55240130029*	22.6	1	-	-	-	1
A55180130009	15.0	1	-	-	-	1
A55280130022	13.5	1	+	1	-	1
A55230240007	147.6	1	+	+	-	1
A55380230010*	22.6	1	+	+	-	2
A55390240012	40.5	1	-	+	-	1
A55270120026	53.5	1	-	+	-	1
A55440340011	140.0	1	-	+	-	1
A55460330005*	20.7	1	+	-	-	1
A55490210001*	41.7	1	-	+	-	?
A55430330035	37.3	2	-	-	-	1
A55340230002	328.2	1	-	+	-	2
A55470220007	113.1	1	-	+	-	3
A55410340024	65.0	2	-	+	-	1
A55490340005	69.2	1	-	+	-	1
A55450310011*	55.9	1	+	-	-	1
A55600330001	89.5	1	-	+	-	1
A55400330023	110.8	1	-	+	-	1
A55550420021	46.0	1	-	+	-	1
A55560320017	389.2	1	-	+	-	1
Total complete	22					
X	103.9					
s	109.8					
Tested cobbles						
A55380230011	296.5	1	+	+	+	-
A55360120008	315.3	2	-	+	-	-
A55450330007	140.6	2	+	-	-	-
A55410340032	536.5	?	-	+	-	-
A55410340034	742.0	1	-	+	-	-
Hammerstones						
A55380230012	198.0	1	+	+	+	-
A55410430005	148.2	?	-	-	+	-
A55410340033	296.4	2	-	-	+	-
A55420320099	10.0	2	-	-	+	-

*incomplete artifacts

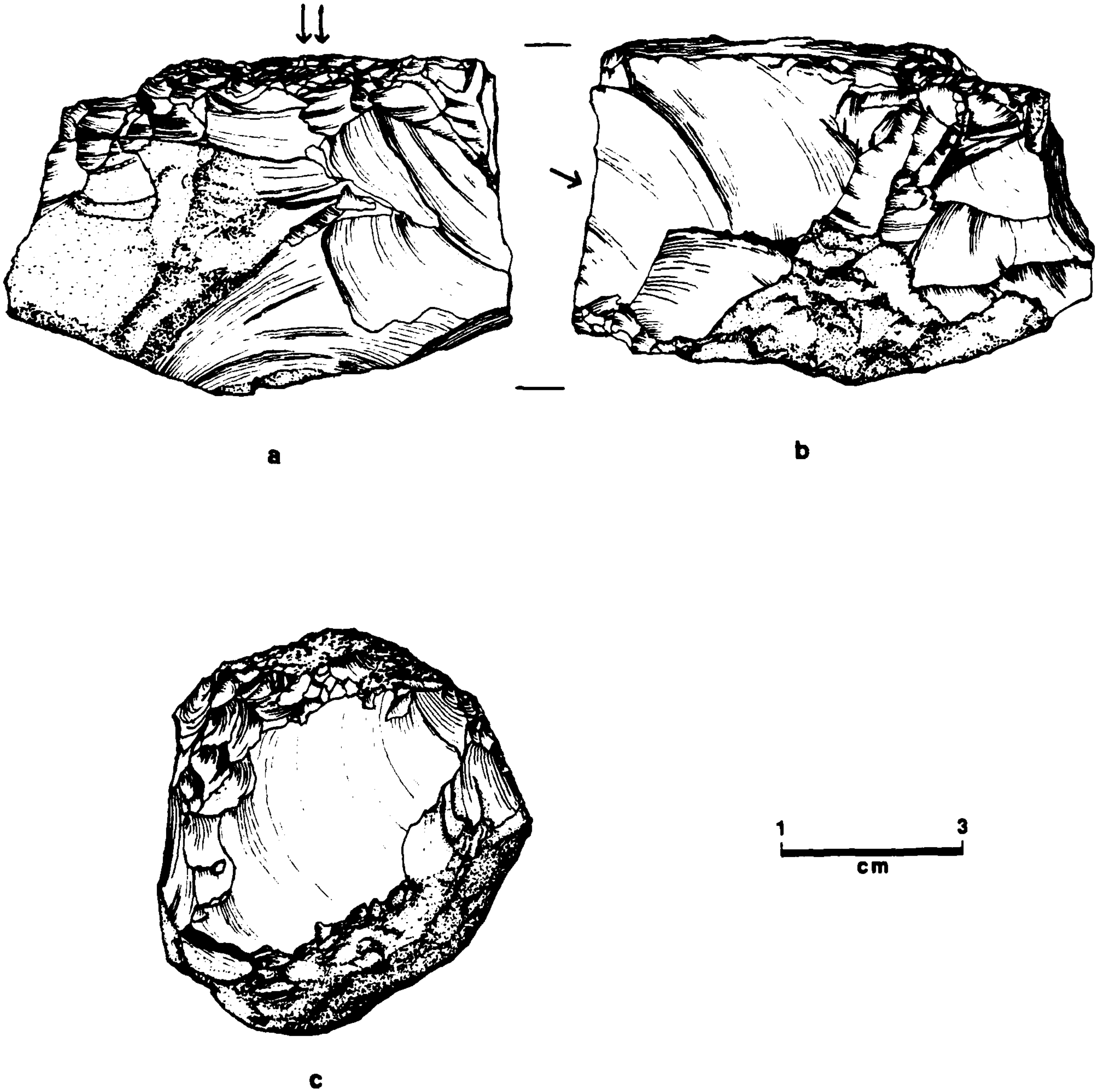

Figure 5.27. Cores, 14BU55; (a,b) A55340230002, (c) A55270130012.

The presence of extensive hydration patina on several of the cores, along with weathered cortex surfaces on others, suggests that both stream beds and quarries or exposed outcrops served as sources for raw material procurement. However, the predominance of Florence A chert, which is found in the stream bed and gravel bars of Bemis Creek (Haury, Chapter 2, this volume), further suggests that areas in close proximity to the habitation site may have served as the primary locations for this activity.

The five tested cobbles recovered from excavations are large 140.6-742.0 gm., Table 5.15) chert pieces that exhibit a single flake scar. After this initial testing, these pieces were undoubtedly determined unsuitable for further reduction by the prehistoric knapper and were subsequently discarded. However, one specimen was further modified during use as a percussor, as noted by the battering and pitting marks on one end of this ellipsoid-shaped cobble.

In addition to the specimen just described, five other hammerstones were recovered from the site. One specimen exhibits negative flake scars in addition to heavy battering marks (Fig. 5.27c), suggesting its use as a core prior to its function as a percussor tool. Two of the hammerstones are water worn pebbles that do not display any additional signs of modification. In addition to exhibiting hydration patina, the fourth hammerstone has also been damaged by numerous thermoclastic scars. The fifth tool in this group is a small (weight=10.0 gm.), fragment manufactured from Florence B chert.

The presence of hammerstones in the lithic collection from Two Deer is an obvious indication that the direct freehand percussion technique of flake knapping prevailed among the prehistoric occupants. By striking vertically to the margin of a lithic cobble with a hammerstone, flakes with pronounced bulbs of percussion and sharp edges could be rapidly removed. These flakes could then be either used in their present condition or modified into a desired tool form. This latter step in tool manufacture often requires a more direct and accurate mode of modification and usually involves an indirect percussion technique (Crabtree 1972:12-3). Evidences for use of this technique are also found at the Two Deer site in the form of semi-pointed, but blunt, antler tines (see Faunal Remains below). That these antler tines were employed as a punch in this technique is speculative; however, the fine pressure flake scars noted on many of the recovered bifacial tools suggests that some form of punch tool was used by the prehistoric artisans in the final stages of tool manufacture. The exact proportion of antler and hammerstone flaking is difficult to determine. However, it can be suggested that the hammerstones functioned primarily as percussion tools during initial processes of core platform preparation and flake blank removal.

Edge Modified Flakes and Chips

Edge modified flakes (470) and chips (360) were the most abundant tool types in the lithic assemblage from Two Deer. Edge modification refers here to both utilization damage and deliberate retouch; the latter being only slightly more common in the assemblage (Table 5.16). Modification in the form of retouch is also present on six potlids and potlid fragments.

Table 5.16. Edge modified flakes and chips, 14BU55.

	Flake	Chip	Total
Retouched			
complete	140	101	241
proximal	54	41	95
distal	31	20	51
medial and lateral	52	22	74
Total:	277	184	461
Utilized			
complete	115	89	204
proximal	36	38	74
distal	19	21	40
medial and lateral	23	28	51
Total:	193	176	369
Total	470	360	830

Table 5.17. Statistical data for complete retouched flakes and chips, 14BU55.

		Flakes	Chips
Length:	$\bar{X}$	31.8	15.2
	s	12.4	2.6
	range	20.0-106.0	9.0-20.0
Width:	$\bar{X}$	22.8	14.3
	s	10.5	5.0
	range	8.0-61.0	.9-29.0
Thk:	$\bar{X}$	5.1	2.5
	s	3.4	1.2
	range	1.2-19.6	1.0-8.5
Weight:	$\bar{X}$	6.5	.6
	s	9.5	.7
	range	.3-64.7	.1-4.3
Edge angle:	$\bar{X}$	56.2°	56.2°
	s	8.9	9.3
	range	34-86°	36-76°

From the data presented in Table 5.17 it can be demonstrated that relatively short, wide flakes and chips were the mean size of retouched tools. However, the wide range in both length and width measurements, in conjunction with the high standard deviations determined for each of these attributes (Table 5.17), suggests that forms other than expanding flakes are present in significant numbers in the assemblage. Observation of the collection reveals that the presence of long, thin, blade-like flakes account for much of this variation. A plot of length vs. width measurements for the complete retouched chips and flakes (Fig. 5.28) further demonstrates this. All points that fall below the solid line in this Figure represent the long, thin tools, which account for approximately 12% of the total number plotted.

Tools with a length/width ratio of 2:1 are present in both retouch and utilized categories. In both groups, these flakes often display a single ridge or keel on the dorsal surface (Fig. 5.29). Keels usually result from previous detached blades, suggesting that blade production may have been a fairly prevalent activity in lithic reduction processes at Two Deer. However, there is no evidence in the lithic collection, such as well prepared blade cores, to further demonstrate this activity or substantiate this suggestion.

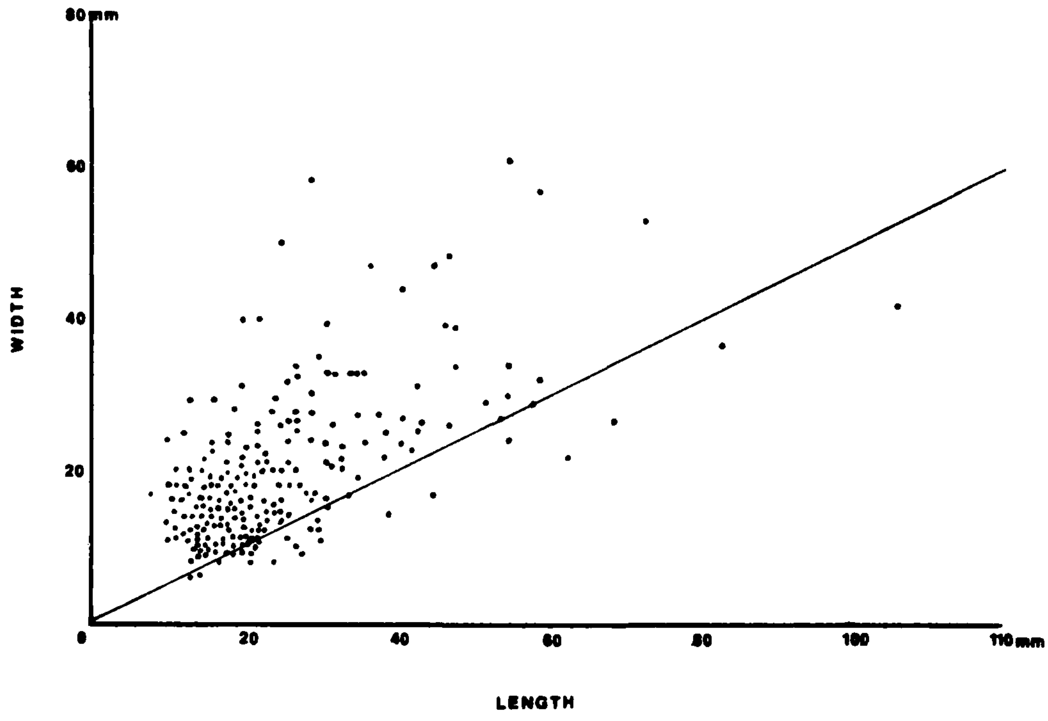

Figure 5.28. Plot of length vs width for complete retouched chips and flakes, 14BU55. Solid line indicates a length measurement of twice the width.

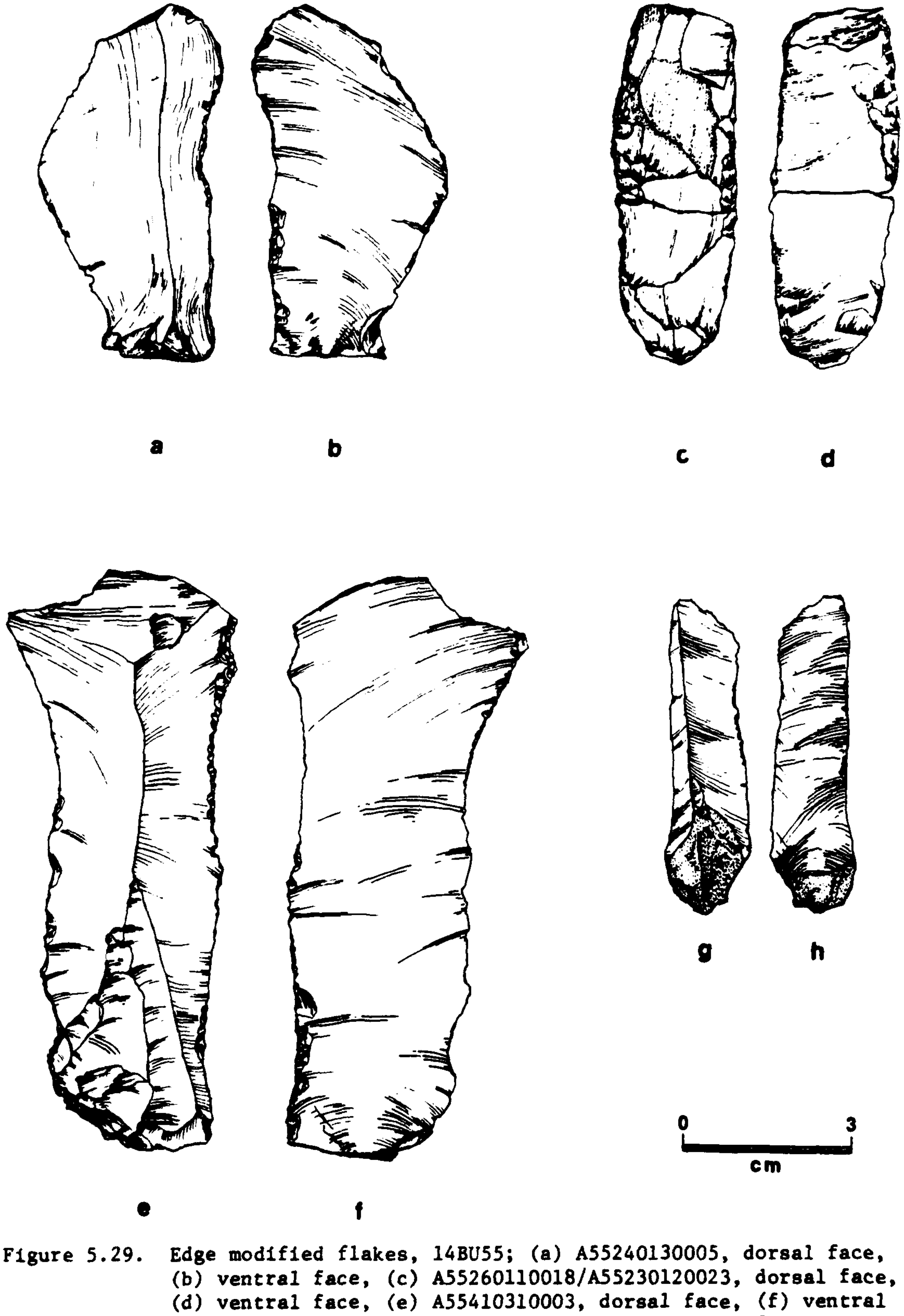

Figure 5.29. Edge modified flakes, 14BU55; (a) A55240130005, dorsal face, (b) ventral face, (c) A55260110018/A55230120023, dorsal face, (d) ventral face, (e) A55410310003, dorsal face, (f) ventral face, (g) A55110220001, dorsal face, (h) ventral face.

Assuming that the sizes of edge modified flakes and chips are representative of the entire collection of flake and chip debitage, two points of interest can be presented. First, the variability observed in all of the continuous measurements of length, width, thickness, and weight (Table 5.17) suggests that a pattern of force used in flake manufacture was not consistently repeated. If such a pattern had been repeatedly used, the result would be observed in a more homogeneous flake assemblage (Crabtree 1972:12). However, despite the variability in sizes, flakes and chips remain relatively small, a factor that prompts the second point. The small size of these flakes could be attributed to an emphasis on the part of the prehistoric knapper to produce flakes suitable for use "as is" or with a little edge retouch, and in the manufacture of bifacial tools. Given the substantial numbers of bifacial tools in the assemblage and the similarities between the mean measurements of flakes and chips (Table 5.17) and finished bifacial tools (Tables 5.8 and 5.9), such a suggestion is possible. This suggestion may be further substantiated by an analysis of the unmodified flakes and chips in the assemblage. This, however, has not been completed; therefore, the idea presented must remain a tentative suggestion.

Table 5.18. Chert type and thermal alteration frequency, retouched flakes and chips, 14BU55.

	Chert Types											
Specimen	Florence A		Florence B		Light gray		Green		Ind./Misc.		Total	
	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat	Heat	No Heat
retouched flake	74	31	-	25	-	2	2	-	-	6	76	64
total:	105		25		2		2		6		140	
retouched chip	73	18	1	4	-	-	1	-	1	3	76	25
total:	91		5		-		1		4		101	
utilized flake	46	29	4	16	1	-	5	2	3	9	59	56
total:	75		20		1		7		12		115	
utilized chip	57	23	-	-	-	1	-	-	3	1	60	29
total:	80		-		1		-		4		89	
retouched potlid	6	-	-	-	-	-	-	-	-	-	6	-
total:	6		-		-		-		-		6	
Total	256	123	5	49	1	3	8	2	7	19	277	174
total:	357		54		4		10		26		451	

From the data presented in Table 5.18, it can be demonstrated that Florence A was the dominant chert type in the edge modified flake and chip assemblage (79%). In addition, over 70% of this chert exhibits signs of exposure to heat sources. While other chert types are present in the assemblage, they are represented by less significant amounts. Florence B accounts for 12%; Flint Hills light gray for .8%; Flint Hills green for 2%; and Indeterminant/Misc. for 6% of the total. Most of the flakes made on these chert types appear unaltered by thermal sources, although it is admittedly difficult to detect such alteration in these less well-known cherts. The high percentage of thermally altered Florence A chert is the main factor that accounts for the high incidence (62%) of this activity in the total assemblage.

A final point of interest found in Table 5.17 that should be addressed is the similarity in edge angles measured on chips and flakes. Both groups display the same mean retouched angle. In addition, the calculated standard deviation and range are also similar between the chips and flakes. Due to their small size for prehension, chips are usually thought of as being hafted. While this may have actually been the practice, the data obtained on edge angles suggests that chips and flakes may have functioned in similar activities at Two Deer, with or without a haft element. The orientation of the mean edges (56.2^{o}) suggest suitability for scraping functions, while more acute edges served in cutting functions.

Debitage

Unmodified chert recovered from the Two Deer site consists of 6910 chips, 2059 flakes, 5238 chunks and shatter, and 143 potlids (Table 5.8). Due to the difficulties in establishing provenience for the material recovered in 1975, the following discussion includes only that material collected in the later years. Also, excluded are the thousands of small chert chips recovered in flotation samples (Table 5.A3).

Figure 5.10 displays the distribution of chipped stone tools within the block excavation. Five excavation quadrants each contained more than 25 morphologically recognized tools; combined this represents 20% of the total assemblage. Debitage recovered from these quadrants, plus the other three quadrants of the excavation unit, account for approximately 36% (5217 pieces) of the material recovered. Therefore, the units that contain high quantities of chipped stone tools (units 22, 23, 41, 42, and 39) also contain a significant portion of the debitage. These figures suggest that the debitage densities in particular units represent more than just areas of discarded by-products of tool manufacture. Instead, they may possibly be areas of tool manufacture, tool resharpening, or a raw material supply depository for the production of additional tools. The fact that the high density units of both debitage and tools are located toward the center of House 1 also suggests that these may have been dominant activities inside the structure.

The former suggestion concerning tool manufacture activities may be further substantiated by an analysis of the distribution of debitage in units other than the ones previously discussed. Of the remaining 64% of debitage recovered from the block excavation, over half of it was located

in units adjacent to the five mentioned above. This includes units 26, 27, 40, 43, 46, and 56. In other words, these six units, in conjunction with the original five, account for more than 70% of the debitage recovered and 35% of the chipped stone tool assemblage. In addition, these units combined represent the heart of the structure and surround the metates and hearth. While a further analysis of the debitage might reveal more information concerning the types of activities the co-occurrence of high quantities of debitage and tools in particular areas initially indicates that these areas represent tool manufacture and/or maintenance localities.

Worked Stone

This assemblage consists of two large metates, four smaller grooved sandstone pieces, one weathered chert implement, and one small limestone bead.

One sandstone and one limestone metate, recovered by the 1975 and 1978 excavations, respectively, were situated within House 1 and lying on the probable living floor. Both are considered stationary objects since they are too large and heavy to be rhythmically or repeatedly moved. They may have been pre-shaped prior to use or modified by continual use. The fine-grained pinkish-gray sandstone metate (verified as sandstone by the Department of Geology, University of Kansas) measures approximately 73.0 cm. in length, 45.0 cm. in width, and 6.0 cm. in thickness. It is saddle shaped in outline and severely fragmented. A definite concave and hyperbolic grinding area, present on one surface, measures 45.0 cm. along the major axis and 25.0 cm. along the minor axis. This concavity may have been produced by prolonged and repeated grinding. The opposite side of the metate has not been modified. The crumbly texture and light color of this implement suggests its exposure to heat sources.

The limestone metate is also fragmented but appears to have been broken at some time prior to the scraping by the road grader. The breaks on this artifact are well rounded and soil has accumulated between the fragments. It measures 64.0 cm. in length, 30.0 cm. in width and 7.0 cm. in thickness. It is roughly rectangular in outline and also shows signs of exposure to heat. A grinding area could not be distinguished on either surface of this metate. Its proximity to the sandstone metate (70 cm.) indicates that the surrounding area may have been used for food grinding and preparation.

Additional worked stone was represented at the Two Deer site by four pieces of grooved sandstone. All pieces are manufactured from a fine-grained, calcareous, pinkish-gray material, similar to that described above for the first metate. Although sandstone is not as ubiquitous in the project area as limestone, it has been described as occurring in the Admire shale formation in the Wabaunsee group (Bass 1929:38-45). This formation is also a chert bearing member in the El Dorado area (Haury 1979:262, and Chapter 2, this volume). Records of wells taken in Cowley County show the sandstone as thin, lenticular beds surrounded by limestone, a phenomenon which results in the sandstone being very difficult to detect. The surrounding limestone has also altered the sandstone, causing its calcareous nature (Krumbeim and Stoss 1963:153), as evidenced by its reaction with a diluted solution of hydrochloric acid.

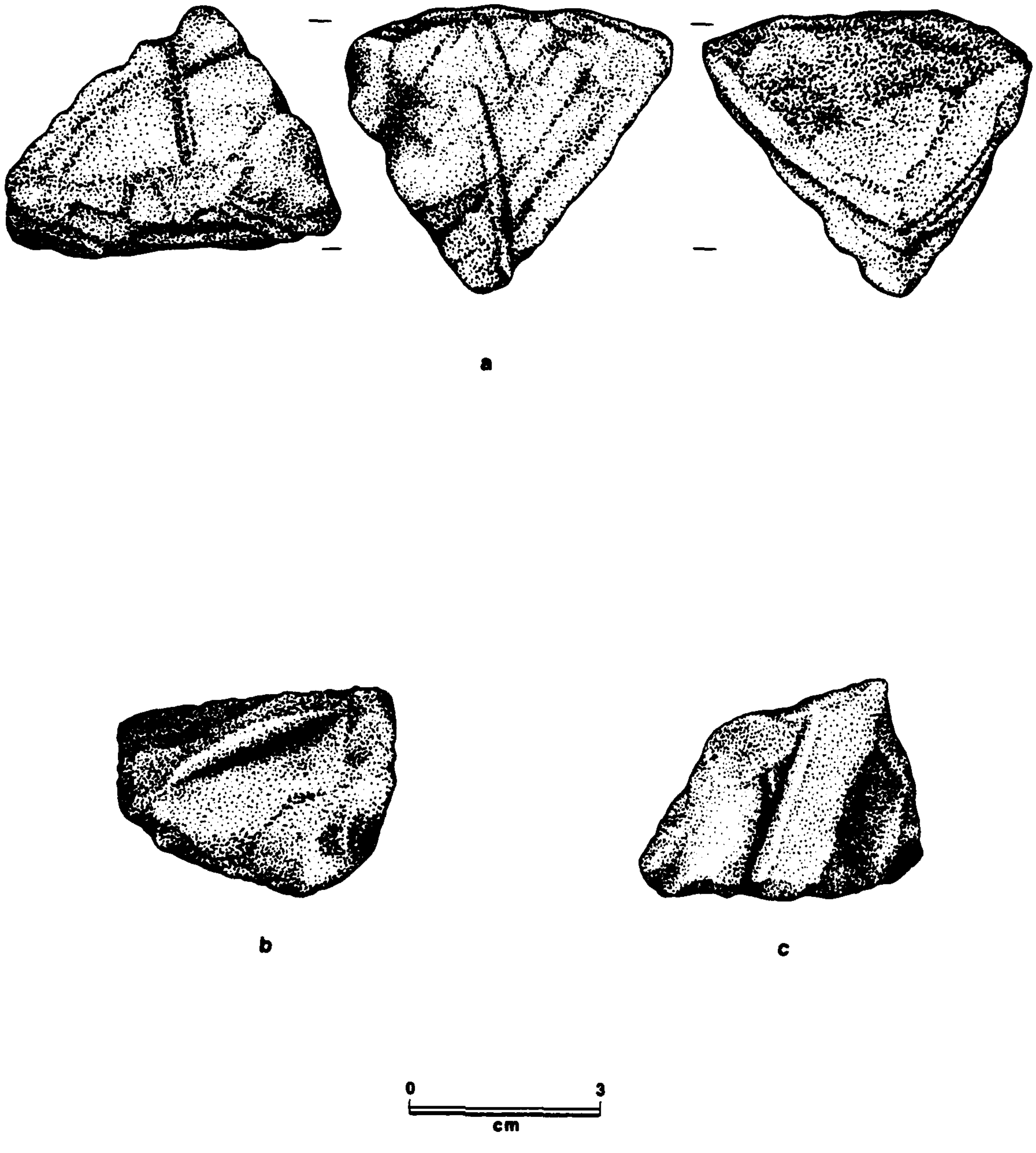

Figure 5.30. Worked sandstone fragments, 14BU55; (a) A55440340013, (b) A55410310012, (c) A55600320001.

The worked nature of the four sandstone pieces consists of shallow, sometimes parallel, grooves on one or more surfaces (Fig. 5.30). One piece (Fig. 5.30a) has been worked on four of its five surfaces. These sandstone fragments probably functioned as abraders in the manufacture of chipped stone tools. One specimen (Fig. 5.31) exhibits a concavity on one surface in addition to its single deep groove on the opposite surface. This fragment at one time probably functioned as a grinding slab.

Another worked stone implement, illustrated in Figure 5.32, possibly also functioned as a grinding slab or nutting stone. Manufactured from weathered chert (for a description of this stone see Artz, Chapter 3, this volume), this tool exhibits a small concavity that measures 4.5 cm. by 3 cm.

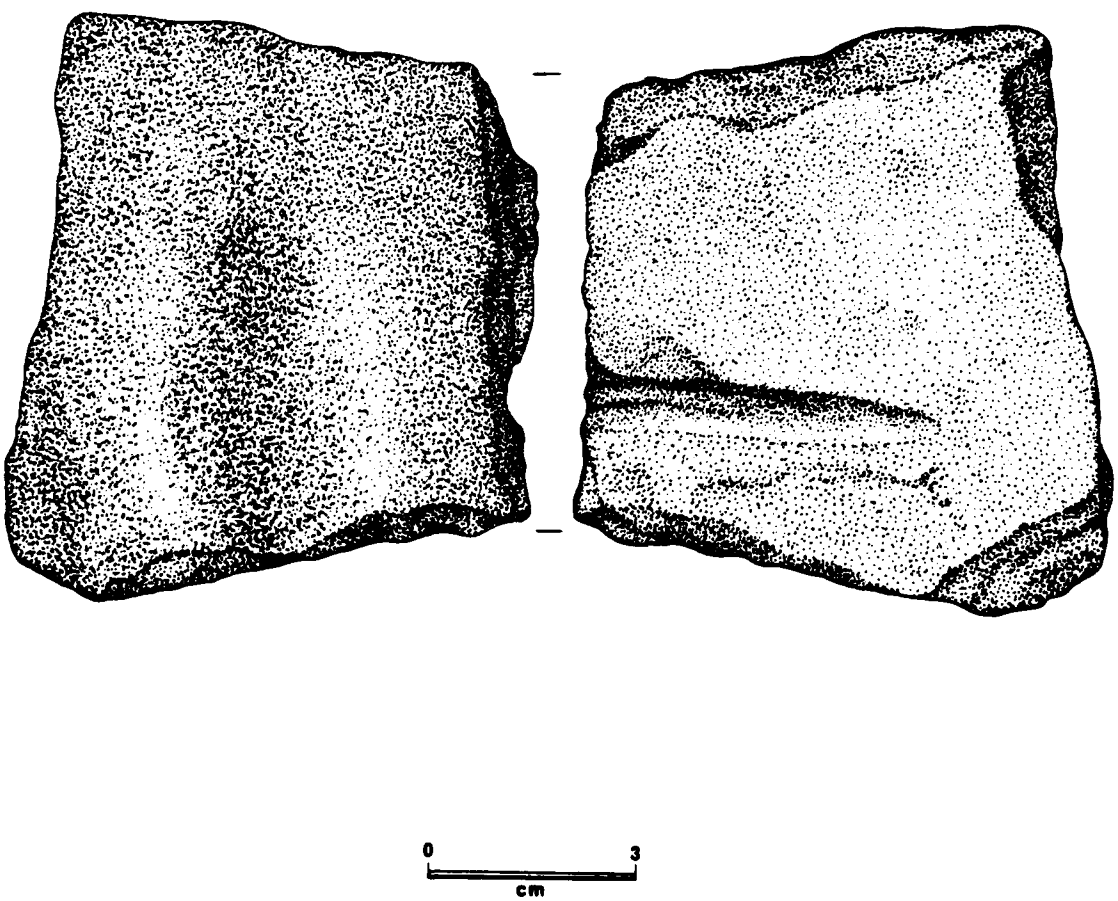

Figure 5.31. Worked sandstone, 14BU55; 55450330022.

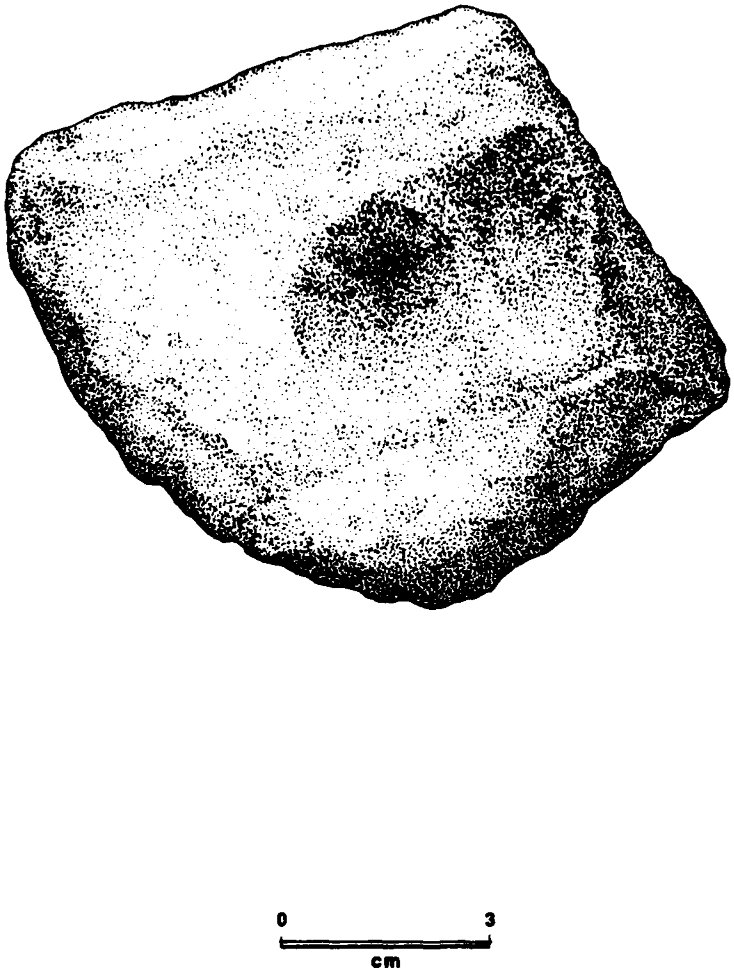

Figure 5.32. Modified weathered chert, 14BU55; A55400110002.

One small round limestone bead was recovered from the interior of House 1. It is slightly asymetrical and measures approximately 3.0 mm. in diameter. Without association with additional similar data, additional discussion on this artifact is unwarranted.

Unworked Stone

Included in this category are 1304 pieces (7.7 kg.) of limestone, 257 pieces (2.5 kg.) of sandstone, 17 cobbles (1.6 kg.), 6 pieces (11.6 gm.) of minerals, and 50 pieces (.9 kg.) of weathered chert; all of which lack evidence of modification or utilization.

Limestone is the most abundant of all unworked stone pieces. The total count above includes those fragments previously described as parts of features and/or hearth cleaning debris. In addition to these concentrations, limestone fragments were numerous throughout the block excavation. Approximately 73% (948 fragments) of this stone evinced the reddish discoloration and chalky texture indicative of exposure to heat sources. These fragments also tended to be the larger ones recovered, accounting for 64% of the total limestone by weight. Some of these thermally altered fragments may have been used as hearthstones or boiling stones; others may have been discolored when exposed to heat when House 1 burned and collapsed; and some, particularly the large fragments, may have functioned as supports for peripheral posts of the structure. Although supportive evidence for the latter suggestion is lacking from the Two Deer site, such a use for limestone has been suggested to occur at the Anderson site at Wolf Creek (Rohn, Stein and Glover 1977:48) where a post stain was found beneath a pile of heat discolored limestone. The fact that the larger limestone fragments recovered from Two Deer exhibit a higher percentage of thermal alteration than the smaller pieces tends to suggest a non-random pattern of exposure to heat sources. If the thermal alteration was totally accidental, as suggested above in the context of House 1 burning, all sizes of limestone fragments should show equal proportions of heated to non-heated pieces.

The sample of unworked sandstone recovered from Two Deer is considerably smaller than for the limestone. Represented by 257 pieces, most fragments appear to be the same type of pinkish-gray sandstone as the large metate. Except for the small concentration of fire-reddened pieces located in unit 42 (see Fig. 5.8), the sandstone was recovered throughout the interior of House 1 as small, isolated pieces. The reddish color and crumbly texture of approximately half of the fragments indicates alteration by heat.

Cobbles are represented in this category of unworked stone by even fewer numbers than sandstone. Most are small (less than 10.0 gm.) and may not be directly associated with the prehistoric occupation of the site. However, cobbles are a good source of chert raw material, as their small size usually requires little preparation for blank removal and they are usually found in quantity in stream beds. Cobbles of Florence A and Florence B chert can still be recovered from the bed and bank deposits of Bemis Creek, a few meters to the north of the occupation.

Hematite is the only mineral present in the lithic assemblage from Two Deer. The six fragments recovered were concentrated at three locations within House 1: 2 fragments (5.2 gm.) from unit 42; 3 pieces (6.0 gm.) from unit 22; and one small piece (.4 gm.) from unit 19. Hematite is a mineral that was commonly used, according to ethnographic accounts, to produce powder suitable for a paint base. While the fragments from Two Deer do not evince signs of utilization, their distribution within the structure suggests they may be related to the same activity.

Weathered chert was recovered from primarily one location within the block excavation. Fifty fragments, several of which articulate, were concentrated in unit 22. While the arrangement of this material suggests something other than a random occurrence at the site, evidence of utilization on these fragments is lacking.

Discussion

Based on the morphological characteristics of the lithic assemblage artifacts, a variety of functions may be inferred. Chipped stone tools from the excavations include hafted bifaces, represented by mainly small, corner-notched, side-notched, and unnotched forms probably used as arrow tips. The function of these tools in hunting activities can be inferred from the presence of impact fractures on the tips of several specimens. A smaller number of hafted bifaces are larger forms more commonly associated with dart throwers and atlatls. Light to heavy cutting or butchering tasks are indicated by various forms of bifacial tools. Most of these tools are relatively thin artifacts that possess parallel lateral edges with edge angles of about 33°. Other bifacial tools are much larger and suggest activities associated with digging or hoeing. Wood-working and chopping tasks are presumed by the presence of heavily utilized scrapers and choppers, while end scrapers and disto-lateral scrapers possibly functioned in hide preparation and scraping activities. Perforating and graving activities are assumed by the presence of nine small tools that exhibit a drill-like protruding tip. Notched and denticulated flakes may have been designed for use with wooden objects while the numerous retouched and utilized flake tools served in cutting or scraping functions.

Worked stone present in the assemblage consists of grooved sandstone fragments which may have functioned as abraders in the manufacture of bifacial tools or wooden projectile shafts. Plant food processing is directly evidenced by four additional worked stone implements, including two metates, one sandstone and one weathered chert fragment.

Procurement and initial reduction of raw materials was a prevalent activity at Two Deer. The dominance of locally available Florence A chert cobbles in the collection, many of which exhibit an hydration patina, suggest that gathering took place close to the site. Stream banks and deposits of Bemis Creek are excellent sources of usable chert. The primary goal of reduction of cores was for the manufacture of flakes. These flakes could be either modified into shaped tools or used "as is" in numerous tasks. The presence of cores, preforms, and chipping debris suggest that the tool manufacturing activities took place at the site. On-site curation of tools is also indicated by the rejuvination of several small projectile points.

Florence A was the dominant chert type identified in the chipped stone tool assemblage (Table 5.19), accounting for 77% of the total number of tools. Other recognizable chert types are present by much fewer numbers. Thermal alteration of chert, particularly Florence A chert, was apparently a common practice at Two Deer. This activity of exposing chert to heat sources was probably also deliberate; if accidental, all tool categories and chert types would show an evenly proportioned amount of thermal alteration. On the contrary, certain tool categories display greater or lesser amounts of thermal alteration than others (Table 5.19). For example, bifacial tools are more commonly heat treated than unifacial scrapers. In addition, thermal alteration of cores and tested cobbles is evinced on only one-third of the total number of such artifacts. As mentioned previously, the heat treated cores tend to be small or fragmented specimens, suggesting that pieces of raw material were not deliberately exposed to heat, a technique used presumably to facilitate flake removal, unless they were small.

Table 5.19. Chert type and thermal alteration of chipped stone tools, 14BU55.

Assemblage	Florence A Heat	Florence A No Heat	Florence A Total	Florence B Heat	Florence B No Heat	Florence B Total	Light Gray Heat	Light Gray No Heat	Light Gray Total	Green Heat	Green No Heat	Green Total	Ind./Misc. Heat	Ind./Misc. No Heat	Ind./Misc. Total	Total Heat	Total No Heat	Total Total
Hafted biface	16	5	21	1	12	13	-	-	-	1	-	1	-	-	-	18	17	35
Non-hafted biface	29	5	34	-	-	-	-	-	-	2	-	2	-	1	1	31	6	37
End scraper	-	1	1	-	2	2	-	-	-	-	-	-	-	-	-	-	3	3
Disto-lateral scraper	6	2	8	-	1	1	-	1	1	-	1	1	-	-	-	6	5	11
Side scraper	6	4	10	-	5	5	-	-	-	-	-	-	-	1	1	6	10	16
Notch denticulate	18	4	22	-	3	3	-	1	1	-	-	-	1	3	4	19	11	30
Chopper	5	-	5	-	2	2	-	-	-	-	-	-	-	-	-	5	2	7
Perforator	7	2	9	-	-	-	-	-	-	-	-	-	-	-	-	7	2	9
Core	11	13	24	-	4	4	-	1	1	-	-	-	-	-	-	11	18	29
Tested cobble	1	1	2	-	2	2	-	-	-	-	-	-	-	1	1	1	4	5

Table 5.19. (continued)

Assemblage	Florence A Heat	Florence A No Heat	Florence B Heat	Florence B No Heat	Light Gray Heat	Light Gray No Heat	Green Heat	Green No Heat	Ind./Misc. Heat	Ind./Misc. No Heat	Total Heat	Total No Heat
Hammerstone	1	-	-	2	-	-	-	-	-	2	1	4
Total:	1		2		-		-		2		5	
Retouched flake and chip	147	49	1	29	-	2	3	-	1	9	152	89
Total:	196		30		2		3		10		241	
Utilized chip and flake	103	52	4	20	1	1	5	2	6	10	119	85
Total:	155		24		2		7		16		204	
Retouched potlid	6	-	-	-	-	-	-	-	-	-	6	-
Total:	6		-		-		-		-		6	
TOTAL:	356	138	6	82	1	6	11	3	8	27	382	255
Total:	494		88		7		14		35		638	

The styles of tools present at Two Deer offer minimal support for recognizing the site as a transitional Plains Woodland-Plains Village occupation. The only morphological category that may be addressed in this issue is the bifaces.

Small, corner-notched points, traditionally associated with the Plains Woodland period, are, however, also found in Late Archaic and post-Woodland sites. While usually thought to represent the introduction of the bow and arrow, these point forms are not a sound indicator of a chronological period. Small, side-notched, and particularly unnotched bifacial forms are, however, more commonly associated with post-Woodland occupations (Wedel 1959). While these are not numerous within the collection at Two Deer, their presence signifies at least the beginning of a shift from exclusively corner-notched forms. The only other archeological site investigated within the project area that yielded similar projectile forms is 14BU71; a date of A.D. 1210 is associated with this occupation (Fulmer 1977:56).

Alternately beveled and diamond shaped beveled knives are also artifact styles assigned to the Middle Ceramic (post-A.D. 1000) cultural period (Wedel 1959, 1963). This type of bifacial tool was also recovered from 14BU71 (Fulmer 1977:47-9). At the Two Deer site, two bifacial tools (type 3) exhibited a single beveled edge on one face. One tool was complete, the other a distal fragment; it is, therefore, unknown whether this latter tool was diamond shaped. Again, the low frequency of this tool type in the collection of non-hafted bifaces from 14BU55 represents the initial change in tool types from primarily Plains Woodland forms to those associated with the Plains Village culture period.

Flotation

As stated in previous sections on field and laboratory techniques, control samples of one-half bushel (17.5 l.) of matrix per 1 by 1 m. by 10 cm. unit were collected during excavations. This represents approximately 6% of the total amount of matrix from each designated area. Sample sizes were increased in areas of high cultural content and features were floated in entirety. The total number of samples was approximately 550.

The residual material remaining after the soil has been removed during flotation is divided into light and heavy fractions. Each of these was sorted according to categories of bone, charcoal, daub, burned earth, limestone, sandstone, pottery, floral remains, and unidentifiable. Total amounts of material recovered for each of these categories are listed in Table 5.A3. These totals represent only the material recovered from samples taken in 1978; sorting of the 1979 samples so far indicates that the same categories are present.

Analysis of the flotation material documented the concentration of all materials in units 22, 23, 26, 38, and 39. This is in agreement with the distributions of chipped stone tools and ceramics (Figs. 5.10 and 5.11) and the debitage density discussed in the lithic assemblage. Following evidence presented by Yellen (1977), the center of a structure, particularly the area

surrounding a central hearth, is a location of primary activity. Occupants of the structure tend to concentrate in this area, that undoubtedly yields the greatest amount of material remains. Areas surrounding the hearth and metates within House 1 at Two Deer were apparently areas of primary and continual activities of the prehistoric occupants.

Faunal Remains

The representation of faunal remains is poor for the Two Deer site assemblage. Of the bone recovered, only a few elements were identifiable. Table 5.20 lists the taxa identifed and the minimum number of individuals represented by those elements. This table also includes both the taxa

Table 5.20. Taxa and minimum number of individuals determined from identifiable bone, 14BU55.

Taxa	Element	MNI
Odocoileus sp. (deer)	2 auditory meatus fragments	3
	1 left astragalus	
	1 right astragalus	
	3 right proximal calcaneum fragments	
	1 tibia fragment	
	1 right distal metacarpal	
	1 right proximal radius fragment	
	2 left proximal ulna fragments	
	4 molars or premolars	
	1 basal antler fragment	
	5 antler tines	
	1 antler shaft	
	1 metapodial condyle	
Procyon lotor (raccoon)	1 mandibular incisor	1
	1 mandible fragment	
	1 left mandible	
Castor canadensis (beaver)	1 molar	1
Sylvilagus sp. (rabbit)	1 vertebrae	1
Bison sp. (bison)	1 tibia fragment	1
	1 sesamoid	
	1 right cuboid	
turtle	3 carapace fragments	1

identified from the 1978 and from the 1979 assemblage. With the exception of three deer antler tines, none of the identifiable remains are burned. Generally, unburned bones recovered from the site are poorly preserved, but the identifiable bones are in somewhat better condition because they are either compact bones or the denser articular ends of long bones. Since these bones are more dense, they tend not to be broken as easily as ribs and the shafts of long bones.

Two of the three antler tines are burned. Based on morphology, they appear to be what are commonly classified as awls. Polish is present on the tips of two of the specimens, while the tip of the third, is broken. Although these specimens could be tools, the possibility does exist that the polish and cracks exhibited by the tine may be the result of natural weathering.

The majority of the faunal remains consists of small, unidentifiable fragments of burned bone. These amounts totaled over 600 gm. (excluding the amount recovered by flotation) and was located primarily around the metates. While bone processing may account for the fragmented nature of the assemblage, the high incidence of burned, fragmentary bone at the Two Deer site may also be explained by the pottery. More than 80% of the pottery is tempered with crushed, burned bone. The high incidence of burning and the small size of the fragments indicates that the bones were first processed and broken into small fragments and then burned. Those pieces which were then to be used as temper were further crushed.

All animals represented in the assemblage from Two Deer are indigenous creatures in the local environment and are common in archeological deposits in the El Dorado area. The remains of raccoon, beaver, deer, and turtle suggest that wooded and riverine habitats were exploited by the prehistoric inhabitants of Two Deer.

Floral Remains

The floral remains from the Two Deer site are one of the more interesting assemblages. Carbonized seeds and nuts recovered from flotation samples taken during the 1978 excavations represent 40 different taxa. Although the 1979 flotation samples have not yet been completely identified, the material recovered is not expected to significantly change the proportion of species already recognized. Table 5.21 provides a list and count of all taxa so far identified from the Two Deer site.

Twenty-one of the taxa listed are represented by six or fewer specimens, many by only one, suggesting that these seeds and/or the plants from which they came, were not dominant food items to the prehistoric inhabitants. In fact, these species may have no relationship whatsoever with the archeological deposit and may be present in the assemblage and charred by fortuitous means (see Root, Chapter 7, this volume). Since the twenty-one species in question are native to the project area and are found in habitats close to the archeological deposit, they may be justifiably determined to be intrusive. One possible exception to this is the presence of three seeds of Iva annua, a seed commonly found in archeological sites and known to have been used as a

Table 5.21. Identified genera of carbonized flora, 14BU55.

Genus/species	Count	Common Name
Agastache sp.	1	giant hyssop
Ambrosia sp.	6	ragweed
Amaranthus sp.	35	pigweed
Arenaria sp.	1	sandwort
Chenopodium sp.	711	goosefoot
Chenopodium hybridum	25	goosefoot
Crataegus sp.	1	red haw
Dianthus armeria	13	pink
Eupatorium sp.	2	boneset
Euphorbia sp.	91	spurge
Galium sp.	8	bedstraw
Gramineae sp.	30	grass
Helianthus sp.	77	sunflower
Hypericum sp.	31	St. Johnswort
Ipomoea sp.	19	morning glory
Iva annua	3	marshelder
Kochia sp.	6	burning bush
Lactuca sp.	1	wild lettuce
Oxalis sp.	1	wood sorrel
Panicum sp.	24	panic grass
Partlenocessus sp.	4	ivy fruits
Physalis sp.	1	ground cherry
Phytolacca sp.	16	pokeweed
Polygonum sp.	1	smartweed
Portulaca sp.	15	purslane
Prunus virginianus	1	choke cherry
Rumex sp.	1	dock
Scirpus sp.	2	bulrush
Sicyosangulatus sp.	2	
Smilax sp.	3	green brier
Solanum sp.	1	
Silene sp.	2	catchfly
Symphoricarpos sp.	11	coralberry
Viola sp.	1	violet
Vitis sp.	1	grape
Unknown	398	
Cucurbita pepo	4	pumpkin/squash
Helianthus annuus	81	sunflower
Zea mays	30	corn
Juglans nigra		black walnut
shell	3651	
husk	127	
meat	123	
Quercus sp.		acorn
shell	80	
cup	2	
meat	30	
Carya cordiformis		shagbark hickory
shell	6	
Celtis occidentalis	2	hackberry

food source, possibly even cultivated. However, the low quantity of this remain precludes a discussion of this plant as part of the subsistence base. If the 1979 flotation samples or future excavations at the site provide evidence for the prehistoric use of this plant as a food item, the interpretation will be modified. At present, only 16 native species are recognized as possible candidates for food use by the prehistoric occupants. These are Amaranthus sp. (pigweed), Chenopodium sp. (goosefoot), Dianthus armeria (pink), Euphorbia sp. (spurge), Helianthus sp. (sunflower), Hypericum sp. (St. Johnswort), Ipomoea sp. (morning glory), Panicum sp. (panic grass), Phytolacca sp. (pokeweed), Portulaca sp. (purslane), Symphoricarpos sp. (coralberry), seeds of the gramineae (grass) family, Juglans nigra (black walnut), Quercus sp. (acorn), Celtis occidentalis (hackberry), and Carya cordiformis (hickory). In addition, carbonized seeds of Zea mays (corn) and Cucurbita pepo (pumpkin) were recovered which undoubtedly constitutes part of the subsistence base.

Table 5.22 provides information concerning habitat, ethnographic uses, and units of recovery for each of the floral remains. Based on information provided here, the plant remains can be grouped into three categories: (1) those for which no ethnographic information concerning their use by native Indian tribes is available, and therefore, are improbable food items; (2) those which are possible food items due to both their concentrations within the site and to their documentation as food resources in ethnographic accounts; and (3) those that are definite food items since they are not native species and must have therefore entered the site by deliberate means.

The first group of plants includes pink (Dianthis armeria) and St. Johnswort (Hypericum sp.). Both are represented by sizeable quantities (13 and 31 respectively) and grow in habitats adjacent to the occupation site. These species are considered improbable food resources for two reasons. First, neither species is known historically to have been collected and used for any reason by North American Indian tribes. Second, these carbonized remains are widely distributed throughout the excavation area, suggesting an accidental and negative association with the prehistoric occupation.

Fourteen genera constitute the second group of possible food resources. These are pigweed (Amaranthus sp.), goosefoot (Chenopodium sp. and C. hybridium), spurge (Euphorbia sp.), panic grass (Panicum sp.), grass (Gramineae), pokeweed (Phytolacca sp.), purslane (Portulaca sp.), coralberry (Symphoricarpos sp.), black walnut (Juglans nigra), acorns (Quercus sp.), hackberry (Celtis occidentalis), and hickory (Carya cordiformis). All of these plants were recorded in ethnographic accounts (Gilmore 1919, Yanovsky 1936) as having served a variety of purposes to native Indian tribes. Young leaves and plants of several species (e.g. Amaranthus sp.) were gathered in the spring and early summer while seeds of these and other plants were collected when they matured in late summer and early fall. The root of the morning glory was commonly used for medicinal purposes (Gilmore 1919) while the poisonous berry of the pokeweed was used in decorating. Nuts, including walnuts, acorns, hickory, and hackberry, are available in the fall and are an excellent food for winter storage. The low quantities of both hickory and hackberry, however, casts some doubt on the importance of this food to the prehistoric inhabitants.

In addition to historical documentation of the uses of these plants, these species are further suggested to represent deliberate procurement due to their concentration within the excavation. Some species are more densely concentrated than others. This is particularly true of Chenopodium hybridium (located in unit 38 only), Helianthus annuus (unit 23 only), and Panicum sp. and unidentified grasses (units 38 and 39). Others, such as Juglans nigra and Quercus sp. are more widely distributed but are represented by exceptionally high quantities (Table 5.21). The concentration of all species mainly in units 22, 23, 26, 38, and 39 suggests a relationship with the metates, used to grind and pound seeds, and the hearth, used to parch or roast the seeds and nuts.

The concentration of Helianthus annuus in one quadrant of unit 23 provides an interesting point for the following discussion. While not recovered from a pit or similar feature, the charred achenes of this plant were found in a small area adjacent to the north end of the sandstone metate. Mr. H. A. Stephans (Professor Emiritus, Emporia State University) described these as 3 to 4 mm. longer than the common sunflower found today; Dr. R. I. Ford (Museum of Anthropology, University of Michigan) placed the achenes within the size range of cultivated sunflower, thus suggesting the domestication of this plant by the prehistoric inhabitants of Two Deer.

The possibility of cultivated sunflower at Two Deer is intriguing, especially when the third group of plants is considered. Two species comprise this category; corn (Zea mays) and pumpkin (Cucurbita pepo). Both of these remains are from plants not indigenous to the Plains area and are the first known for sites in the El Dorado area and, therefore, provide the earliest evidence for agriculture.

An examination of the corn kernels by Dr. Ford revealed several interesting points. The lack of the embryonic sections and overall crescent shape of the kernels are characteristics typical of Eastern eight row or Northern Flint corn. However, the small globular sizes of the kernels from Two Deer suggest a corn type other than the classic 8-rowed variety. In the absence of preserve corn cobs or fragments, it was suggested that the charred kernels represented a mixture of row numbers 8-12+ rows that may have been evolving toward 8-row dominance (Dr. R. I. Ford, personal communication, letter dated May, 1980). This variety was most common to the Plains area after A.D. 1000.

Species level of the charred squash seeds was also confirmed by Dr. Ford. The seeds are badly distorted by fire and charring has removed many of the diagnostic characters. Like the corn kernels, the squash seeds recovered from Two Deer are dissimilar to those found in later period sites; they are long, quite narrow, and average 7.4 mm. in length. The common Mandan variety squash, typically found in later period sites, averages about 10 mm. (Dr. R. I. Ford, personal communication, letter dated May, 1980).

The charred cultigens recovered from Two Deer help to document the spread of corn and squash throughout the Central Plains in prehistory, while providing the first evidence for agriculture in the project area. If cultivated sunflower is added to the list of cultigens (positive identification of domestication awaits further analysis), an interesting point can be made. Cultivated corn, squash, and sunflower were dominant subsistence resources

Table 5.22. Ethnographic uses, preferred habitat, and unit of recovery for identified flora, 14BU55.

Species	N	Habitat[1]	Units of Recovery	Etnographic Uses[2]
Amaranthus sp.	35	floodplain forest, cultivated field	38,39	seeds used in pinole, dried for future use, boiled, used in breads; leaves and young plants used as vegetables
Chenopodium sp. C. hybridium	711	floodplain woods, cultivated fields	22,23,38	seeds ground for flour; parched and mixed with cornmeal; young stems and leaves boiled for greens
Dianthus armeria	13	fields, floodplain woods, prairie	36,17,22, 38,19	-
Euphorbia sp.	91	alluvial soils along streams, cultivated fields, prairies	11,17,20, 22,23,38,38	leaves and roots used for chewing
Helianthus sp.	77	prairies, fields, waste areas, flood-plain woods	22,39	seeds eaten raw, dried, roasted, ground, or cooked; tubers eaten raw or boiled
Helianthus annua	81	prairies, fields, waste areas, flood-plain woods	23	seeds eaten raw, dried, roasted, ground, or cooked tubers eaten raw or boiled
Hypericum sp.	31	margins of drainages, open wooded areas, prairies	39,22,24,27, 19,36	-
Iopomoea sp.	19	stream valley woods, low prairies, cultivated fields	23,39	roots used for medicinal purposes or roasted in time of famine
Panicum sp.	24	cultivated fields, prairies, open wooded areas	38,39	seeds ground and used with cornmeal or dried in the sun and eaten raw
Phytolacca sp.	16	margins of wooded areas, fields, waste ground	18,21	leaves and stocks used for food; seeds used for paint and decorative purposes

Table 5.22. (continued)

Species	N	Habitat[1]	Units of Recovery	Ethnographic Uses[2]
Portulaca sp.	15	cultivated fields, waste ground	26,39	seeds ground for bread and mush; leaves used for greens
Symphoricarpos sp.	11	floodplain woods, slopes, prairies	18,21	leaves used for medicinal purposes; fruit or berries eaten raw
Juglans nigra	3900+	floodplain woods	21,22,23,24, 26,27,38,39	nuts used as food, stored for winter; root used to make black dye
Quercus sp.	110+	rocky wooded slopes, floodplain woods	22,23,24,26, 28,38,39	acorns dried and ground and meal was percolated with water until sweet; bitterness extracted by leaching with wood ashes
Celtis occidentalis	2	rocky uplands, wooded stream valleys	38	seeds eaten mixed with parched corn and fat; also pounded fine and used to flavor meat
Carya cordiformis	6	woods along streams, drainage areas	22	nuts eaten raw or dried for future use
Cucurbita pepo	4	cultivated species	26,38,39	planted and eaten as food
Zea mays	30+	cultivated species	22,23,26	planted and eaten as food

[1]from Baker 1969
[2]from Gilmore 1919 and Yanovsky 1936

(along with beans) recovered from later Central Plains sites. The occurrence of these three cultigens earlier in time and in a different geographical area suggests a Woodland affiliation origin for this subsistence base. This is not to suggest Two Deer as a direct antecedent of the Central Plains tradition, only that a subsistence based on corn, squash, and native sunflower was known and practiced prior to the later traditions.

Based upon identification of both floral and faunal remains, two modes of resource gathering are evident. First, the faunal remains of deer, raccoon, beaver, and turtle and the floral remains of pigweed, goosefoot, pokeweed, and spurge suggest a hunting and gathering subsistence pattern in which the wooded and riverine habitats were exploited. The presence of cultivated species documents agriculture as the second, and perhaps equally as important, manner of food procurement.

Summary

The Two Deer site, located on the west bank of Bemis Creek within the floodplain boundaries of the El Dorado Lake, has been the focus of investigation by the Museum of Anthropology, University of Kansas, for three seasons. This report presents the results of the latter two seasons of work, 1978 and 1979. While surface debris contains artifacts daignostic of Archaic, Plains Woodland, and Plains Village culture periods, subsurface investigations have been confined to one occupation, dated at A.D. 1000±25. This prehistoric occupation is identified by two closely-spaced structures, chipped stone tools indicative of a variety of activities, a large quantity of debitage and ceramic fragments, ground stone tools including two metates, poorly preserved faunal remains, and carbonized remains of cultivated sunflower, corn, and squash, along with a variety of locally available plants. The quantity of this material, in conjunction with its distribution within one structure, House 1, suggests a more intense occupation than known for any other site of this time period so far investigated within the project boundaries.

Two radiocarbon dates were obtained from this site after initial testing in 1975; five more were provided from charcoal recovered in 1978. Only one of the latter dates did not adequately reflect the prehistoric occupation and was statistically rejected. The remaining six dates were averaged with a resulting date of A.D. 1000±25. This time represents about the conventional dividing date of Plains Woodland and Plains Village culture periods (Johnson, in press). While conventional dividing points are of sometimes little value in interpretating archeological deposits, the artifacts recovered from Two Deer also suggest a mixture of traits from the two cultural periods. In order to fully delineate the transitory nature of the Two Deer site, a discussion of what constitutes Plains Woodland and Plains Village periods is first presented. This is accomplished primarily by a presentation of pan-Plains traits for each period along with the cultural variants attributed to each.

Chronology

The Plains Woodland period is best known from investigations in the Central Plains, although there are indications that people of this culture also occupied parts of the Middle Missouri region to the north, portions of Oklahoma to the south, and areas extending west to the Colorado Rockies (Wedel 1961:284). Wedel further describes the Plains Woodland culture as consisting of two, partially coeval, complexes; the Hopewellian phase and the Plains Woodland phase (Wedel 1959:624-6). The former is geographically restricted to areas surrounding the juncture of the Kansas and Missouri Rivers. Material recovered from these sites has affinities with Middle Woodland sites located further east in Missouri and Illinois (Johnson, in press). Regional variations of the Hopewell period were identified in southeast Kansas by the Cuesta phase and the Hopewell phase (Marshall 1972). Ceramics resembling those descriptive of this culture have also been recognized from the Snyder site, 14BU9, in the El Dorado area (Grosser 1970). Without further discussion of the Hopewell phase and its characteristic artifacts, it will suffice here to say that the materials recovered from the Two Deer site do not resemble the Hopewellian artifacts from either the Kansas City area or the Snyder site.

Artifacts recovered from Wedel's Plains Woodland phase are, however, present at the Two Deer site. Plains Woodland sites are described as smaller and less intensely occupied than the Hopewell. Principal variants of the Plains Woodland include the Sterns Creek focus, the Loeske Creek focus, the Valley focus, the Keith focus, the Greenwood phase, and the Grasshopper Falls phase. The artifact inventory of these sites is much smaller and less varied than that found at Hopewellian sites and includes stemmed and corner-notched projectile points, end scrapers, bifacial knives, choppers, grinding slabs, grooved sandstone abraders, and pebble hammerstones (Wedel 1959: 625-6; 1961:90-1). Pottery is a characteristically styled heavy and coarse ware, with grit or limestone temper and cord-roughened exterior surfaces. Vessel shape is predominately a wide-mouthed jar with a pointed bottom. Variations in this basic style are observed in the recognized Plains Woodland variants assemblages. House remains from Plains Woodland sites are scanty and inconclusive and are usually located along stream terraces. Subsistence was based primarily on hunting and gathering with minimal evidence for agriculture.

The following Plains Village cultural period is recognizable in archeological deposits some time after ca. A.D. 1000 and continues until the historic period of European settlement (Lehmer 1971, Wedel 1959). Included in these semi-sedentary complexes are several manifestations of the northern Central Plains area; the Upper Republican, Nebraska, and Smoky Hill aspects, commonly referred to as the Central Plains tradition. The Middle Missouri and Coalescent cultural traditions comprise the additional broad cultural traditions within the Plains Village pattern (Lehmer 1954:140). The Pomona focus of eastern Kansas is an additional major expression of this cultural period. Substantial earth covered dwellings and agricultural crops of corn, beans, squash, and sunflower characterize the Plains Village tradition. Chipped stone

including small, triangular side-notched and unnotched projectile points, snub-nose end scrapers, side scrapers, diamond-shaped beveled knives, reflect a more extensive and varied artifact inventory than for the preceding Plains Woodland. A variety of bone tools (e.g. bison scapula hoes and fishing hooks) adds to the characteristic artifacts from these post-A.D. 1000 sites. Ceramics are globular to round shouldered vessels that are either cord roughened or smoothed on the exterior surfaces. Decoration varies considerably among the traditions. Pomona focus sites manifest several of these diagnostic characteristics but lack convincing evidence of agriculture and the typical four support post earth lodge. Witty (1978:62) describes this cultural manifestation as representing a late survival of Plains Woodland characteristics with some shared traits from the adjacent Central Plains sites.

Also included within the Plains Village period are the Great Bend aspect and the less well-known complexes of Bluff Creek and Pratt in south-central Kansas. The characteristics of the Southern Plains manifestations of the Custer and Washita phases are evident within several of these Central Plains sites; however, Lehmer did not consider this geographical area when defining the above characteristics of the Plains Village tradition. Therefore, while their temporal association places them within this broad pattern, their cultural remains vary somewhat from the defined characteristics originally delineated by Lehmer (1954, 1971) and Wedel (1959, 1961).

The Two Deer site has been, on numerous occasions, cited as a transitional Plains Woodland-Plains Village occupation. One initial problem facing a discussion of this transition is a comparison of this site with defined Plains Woodland and Plains Village manifestations that have been defined according to both the Midwest Taxonomic System (McKern 1939) and the Cultural Historical Integration Method.

Given the recognized traits that define both Plains Woodland and Plains Village traditions, the following Woodland traits are evinced at Two Deer: (1) large cord-roughened jars with conical bottoms; (2) large dart points in conjunction with smaller corner-notched forms; and (3) a basic artifact inventory including end scrapers, choppers, bifacial knives and worked stone implements. Plains Village traits are also recognizable and include: (1) globular shaped vessels with both cord-roughened and smoothed exteriors; (2) small side-notched and unnotched projectile points along with two beveled knives; and (3) definite evidence for agriculture that includes corn, squash, and sunflower. Additional characteristics of the Two Deer site, such as a semi-sedentary settlement, a wattle and daub house structure and a supplementary hunting and gathering subsistence pattern, can be attributed to either cultural period.

Comparisons With Other Sites

The architectural remains and artifact assemblage from Two Deer are similar in some attributes to the material recovered from other occupations of about the same time. Included in this comparison are sites assigned to the Greenwood phase, the Pomona focus, the Bluff Creek complex, the Grasshopper Falls phase, the Cuesta phase, the Butler phase, and the cultural

manifestation at the Uncas site. Sites used in this discussion are located within the geographical areas and reservoir salvage projects presented in Figure 5.33.

Ceramics from Two Deer were compared to assemblages collected from 14MM7 (an early Pomona focus occupation), 14HP1, the Dow Mandville site (a Bluff Creek complex site), and the defined wares of Greenwood and Verdigris from northeast Kansas. The presence of bone temper, globular and conical shaped vessels, and cord-marked and smoothed exteriors precludes a classification of the Two Deer site ceramics with any of the previously defined types.

Architectural remains were also compared with other sites and complexes, including the Uncas site, Cuesta phase sites, Grasshopper Falls phase sites, Bluff Creek complex sites, and Pomona focus sites. As with the ceramic assemblage, the structures at Two Deer do not resemble any previously defined architectural remains. Briefly, the ground level construction, interior hearths and pits, and large quantities of artifacts suggestive of an extensive occupation within the house combine to differentiate the structures at Two Deer from those of other Plains Woodland and Plains Village sites.

The chipped stone tools assemblage from Two Deer was not formally compared with assemblages from other sites. Many of the morphological tools present in the collection are stylistically pan-Plains; that is, they are common in sites throughout the Central and Southern Plains. Therefore, a comparison based on such artifacts as corner-notched hafted bifaces, offer limited evidence for cultural affiliation.

The lack of convincing evidence for strong similarities between archeological remains at Two Deer with other single sites or regional complexes prohibits the labeling of Two Deer as representative of such taxonomic units as the Pomona focus, the Bluff Creek complex, the Grasshopper Falls phase, the Greenwood phase, or the Cuesta phase. Even within the project area, the defined Butler phase Woodland of the Snyder site (Grosser 1970) is not expressed in the occupation at Two Deer, as this phase exhibits ties with the earlier Hopewellian variant of the Plains Woodland.

However, it is possible to present selected attributes ot the ceramic assemblage and distinctive morphological tool forms from the collection of Two Deer as evidence for cultural affiliation within a broader taxonomic unit than that represented by one site or within one phase or focus. On this basis, the broad cultural patterns of Plains Woodland and Plains Village, in conjunction with the characteristic artifact inventories and subsistence patterns of each, described above, offer a sound basis for comparisons with Two Deer. Thus, the conical shaped ceramic vessels, small corner-notched arrow points and larger dart points, and a basic hunting and gathering artifact inventory are representative of Plains Woodland sites while the globular shaped ceramic vessels, small, side-notched and unnotched arrow points and beveled knives, and agricultural crops are more distinctively Plains Village characteristics.

As stated in the research design of this chapter, the transition between Plains Woodland and Plains Village is likely to be subtly represented in an

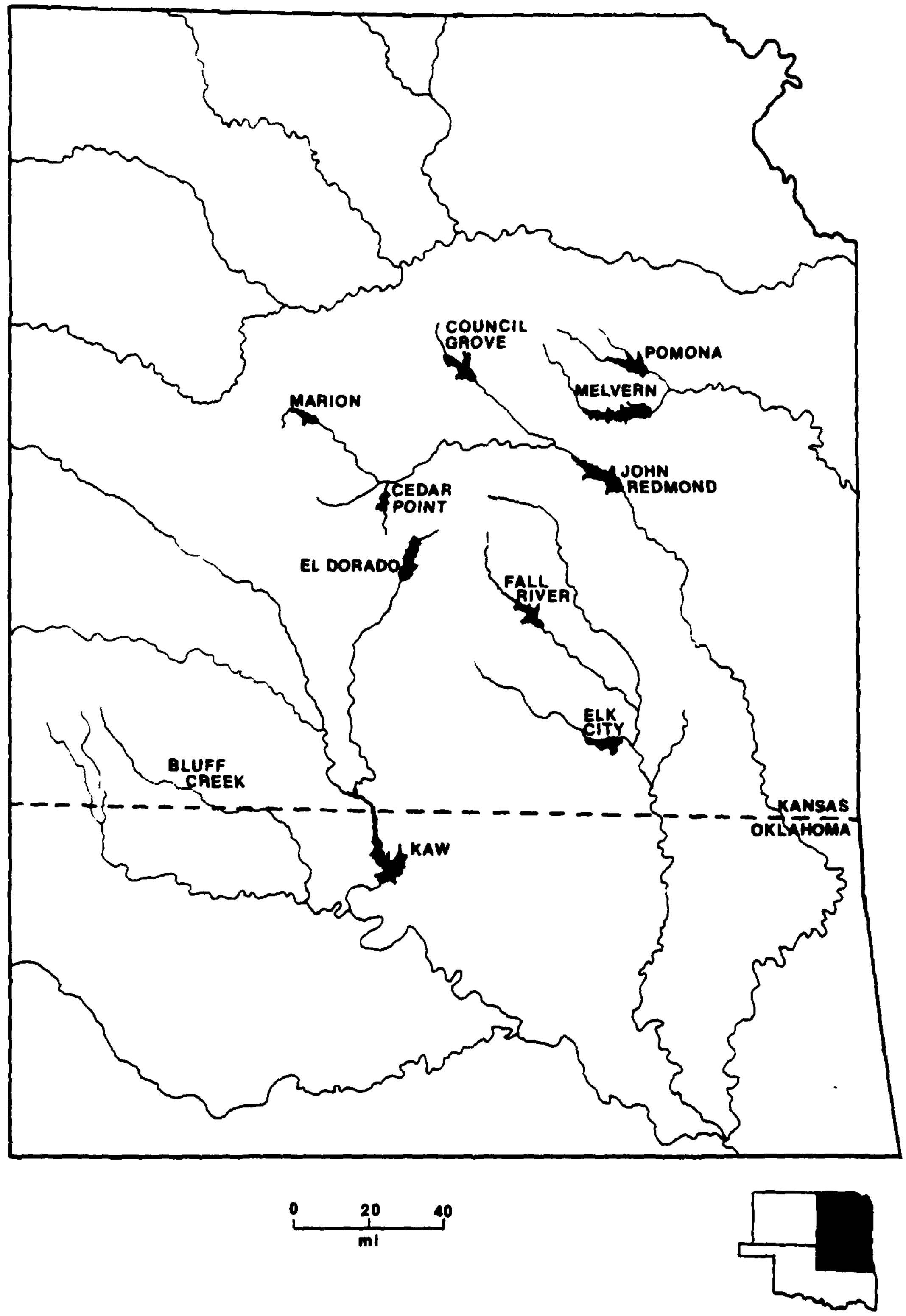

Figure 5.33. Location of sites and phases within major reservoirs used in a comparison with Two Deer.

archeological deposit, particularly one representing the initial stages of such a transition. This phenomenon is precisely that which is evinced at Two Deer. Admittedly, the artifact assemblage predominantly reflects a Plains Woodland cultural affiliation. However, reflected in a developmental stage are several Plains Village traits. The low numbers of side-notched and asymmetrical unnotched projectile points, bifacial knives that are beveled on only one lateral edge rather than alternate edges, and the low frequencies of ceramic rim and basal fragments from globular vessels provide evidence for these traits in an initial stage of appearance and development. That these traits more fully developed into more "classic" Plains Village diagnostics within the project area is evident by the artifact assemblage recovered from 14BU71 (Fulmer 1977) dated to A.D. 1210. In an initial transitory site, like Two Deer, one would therefore not expect to recover these artifacts in their more classic forms. The charred cultigens recovered from Two Deer also reflect this transition in that they are viewed as representing a simpler stage of fully developed agriculture, such as evident in the Central Plains tradition. This is not to suggest that the prehistoric inhabitants of Two Deer did not rely on agricultural foods for a substantial portion of their diet; rather, the quantities recovered are just not as abundant as that found in later sites. In addition, functional artifacts such as bison or deer scapula hoes are conspicuously absent from Two Deer.

Given the fact that, so far, recognized Plains Village sites within the project area are extremely few, the influence that resulted in Two Deer reflecting a transitional Plains Woodland-Plains Village occupation is difficult to explain. Several alternative suggestions are possible: (1) additional Plains Village sites exist in the local area, perhaps outside the project area, but have not yet been identified. Prehistoric occupants of these sites may have been contemporary with peoples living at Two Deer and may have been gradually influencing the resulting change. (2) A migration of people and/or styles, reflective of the Plains Village cultural pattern, into south-central Kansas resulted in an adaption and local development of several distinctive traits; and (3) internal factors within the Plains Woodland sites prompted this development.

Each of these alternatives is an attempt to explain culture change. However, within the project area, data are simply insufficient to adequately address this issue and evaluate the suggestions. The transition from Plains Woodland to Plains Village traditions is, in fact, an issue that spans the entire Central Plains area and would, therefore, require research that exceeds the scope of this report. Whatever the cause that resulted in this shift, the primary important point presented here is that the transition is recognized within an archeological deposit. In addition, the artifacts indicative of this transition are in initial developmental stages, suggesting that the change may have been somewhat gradual; distinctive Plains Village traits are reflected in another archeological deposit in the project area that dates one thousand years later.

Conclusions

Extensive data recovery at 14BU55, the Two Deer site, has resulted in a substantial collection of tools and other lithic artifacts, ceramics, floral

and faunal remains, and direct evidence of habitation structures and early agriculture. Analyses of the artifact assemblages have demonstrated a predominant Plains Woodland cultural affiliation. Additional subtle Plains Village traits, evident in the site, are viewed as direct evidence for the local continuity between Plains Woodland and Plains Village cultural patterns. As such, the Two Deer site may be validly termed a transitional site between these two major periods in Plains prehistory.

Undoubtedly, additional excavations at Two Deer would only enhance or strengthen this conclusion. However, just as important to understanding this transition, is the investigation of additional Plains Woodland sites and particularly the one recognized Plains Village site in the project area, 14BU71.

In conjunction with evidence from the Snyder site (Grosser 1970), in which the local continuity between the Archaic and Plains Woodland periods is suggested, the transitory nature of the Two Deer site adds support to the idea that the Upper Walnut River Valley provided a suitable location for continual prehistoric occupations for thousands of years.

Acknowledgements

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We would also like to acknowledge the assistance of Ethne Barnes, who offered her time and advice in the field on several occasions. In addition, our husbands, Bill Adair and Ken Brown, deserve thanks for their continual support throughout the duration of this project.

Appendix 5.A

Supplementary Tables of Data

Table 5.A1. Descriptive data for ceramic fragments, 14BU55.

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55000050178	8	11	11	3	2	6	2	2	8.4	1	2	1.75
A55000050173	8	21	12	3	2	6	2	1	6.1	3	1	-
A55000050172	8	11	11	3	2	6	1	2	8.5	3	3	-
A55000050181	8	8	8	3	2	6	2	2	6.6	1	1	1.50
A55000050182	25	17	17	3	2	10	4	1	6.2	3	2	-
A55000050183	8	28	22	2	2	6	2	2	7.5	1	3	3.00
A55000050185	8	24	24	2	2	6	2	2	6.4	3	1	1.50
A55000050187	8	22	22	2	2	6	2	1	8.3	3	3	-
A55000050176	1	10	10	3	2	6	2	2	9.3	2	2	0.75
A55000050184	2	17	17	2	1	1	2	1	9.1	4	-	-
A55000050174	21	21	12	3	2	6	2	1	8.2	3	3	-
A55000050175	8	22	11	3	2	6	2	1	6.3	3	3	-
A55000050177	8	27	22	3	2	6	2	1	6.7	3	1	-
A55000050170	7	9	11	3	2	6	12	3	10.0	1	1	-
A55000050171	8	18	22	3	2	6	2	2	6.5	1	1	1.50
A55000050179	7	12	11	3	2	2	2	2	8.9	4	-	-
A55000050180	5	23	12	3	2	13	2	2	5.8	4	-	-
A55000060038	8	21	11	3	2	6	2	3	12.0	3	2	1.50
A55000060030	8	11	21	3	2	6	2	2	6.0	1	1	1.50
A55000060041	8	18	11	3	2	6	2	2	6.3	1	1	1.75
A55000060033	1	22	23	3	2	6	12	2	8.0	2	1	1.25
A55000060028	8	8	8	3	2	6	2	2	7.7	1	1	1.50
A55000060027	8	11	12	3	2	6	2	2	7.2	1	2	1.50
A55000060037	8	17	22	2	2	6	2	3	8.0	3	3	-
A55000060034	8	22	22	3	2	6	2	3	6.7	1	3	1.50
A55000060039	8	22	22	2	2	6	2	2	8.0	1	1	2.00
A55000060031	8	22	12	3	2	6	2	2	7.5	1	1	1.50
A55000060040	8	22	22	3	2	6	2	3	8.3	3	3	-
A55000060032	8	9	1	3	2	6	1	1	6.4	3	3	-
A55000060029	8	9	22	3	2	6	1	3	6.8	1	1	1.50
A55000070002	8	9	9	3	2	6	2	2	8.0	1	1	1.50
A55000070003	8	9	22	3	2	6	2	2	9.1	1	1	2.00
A55000070004	8	22	22	2	2	6	2	2	6.2	1	1	1.25
A55000070005	21	21	12	3	2	6	2	2	11.0	1	1	1.50
A55000070006	21	21	12	3	2	6	2	2	11.0	1	1	1.50

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55100310001	8	9	9	2	2	6	2	2	9.2	1	1	2.00
A55100440001	8	9	11	3	2	6	2	1	9.5	3	3	0.
A55100440002	8	9	9	2	2	6	2	2	8.7	1	1	2.00
A55100310002	8	9	17	2	2	6	2	2	7.2	1	3	1.50
A55100330002	8	9	9	2	2	6	2	2	6.0	1	1	1.50
A55100410002	8	9	11	3	2	6	2	2	7.4	1	1	1.50
A55100240001	8	10	10	3	2	6	2	2	8.1	1	1	2.00
A55100440003	8	9	11	3	2	6	2	2	8.4	3	1	1.50
A55100420001	8	9	10	3	2	6	2	1	6.8	3	1	1.50
A55100310003	8	9	7	2	2	6	1	2	6.5	1	1	2.00
A55100140004	8	9	9	2	2	6	2	2	6.4	1	1	1.50
A55100410004	8	9	14	2	2	6	1	2	4.0	3	1	1.50
A55100410003	8	9	9	2	2	6	1	2	8.0	1	1	1.50
A55110310009	18	9	17	2	2	6	2	2	10.3	1	1	1.50
A55110330001	8	10	11	3	2	6	2	2	7.9	1	1	1.50
A55110310006	18	9	17	2	2	6	2	2	10.3	1	1	1.50
A55110330002	8	10	11	3	2	6	2	2	7.9	1	1	1.50
A55110310007	8	10	11	3	2	6	2	2	8.8	1	3	0.
A55110220003	8	9	9	2	2	10	2	1	8.0	1	3	1.50
A55110310010	8	11	8	3	2	6	2	2	7.4	1	1	1.50
A55110310008	8	10	11	3	2	6	2	2	8.8	1	3	0.
A55120310001	8	11	11	3	2	6	2	2	8.3	3	1	0.
A55120240002	2	9	9	3	2	6	1	1	7.5	3	3	0.
A55130330002	8	17	17	2	2	6	2	1	5.4	1	3	1.50
A55130330007	8	17	17	2	2	6	2	1	5.4	1	3	1.50
A55130310003	8	10	12	3	2	6	2	2	6.8	1	1	1.00
A55130330003	8	17	17	2	2	6	2	1	5.4	1	3	1.50
A55140310004	8	9	9	2	2	6	2	2	7.5	1	1	1.50
A55140010001	8	9	12	3	2	6	2	2	7.0	1	1	1.50
A55140220005	8	8	17	2	2	6	2	1	10.0	3	3	0.
A55140320001	8	22	10	3	2	17	2	2	10.8	3	3	0.
A55150130002	8	22	8	2	2	6	2	3	9.9	3	1	0.
A55150310004	8	10	12	3	2	6	2	2	6.8	1	1	1.00
A55150140002	8	9	10	3	2	6	2	2	7.5	1	3	1.00
A55170330001	8	12	10	3	2	6	2	2	7.6	1	1	1.50

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55360120004	8	10	14	3	2	6	1	2	5.1	1	1	1.50
A55360110005	8	23	12	3	2	6	2	2	6.7	1	1	1.25
A5536C120002	8	22	11	3	2	6	2	1	9.1	3	3	0.
A553600C0002	8	23	12	3	2	6	2	2	7.7	2	1	1.50
A55360130004	8	23	12	3	2	6	2	2	6.6	2	1	1.50
A55360110004	8	10	12	3	2	15	2	2	8.9	2	1	1.50
A55360130002	8	11	11	3	2	6	2	2	7.4	2	1	1.75
A553600C0001	8	25	12	3	2	6	2	1	8.1	3	3	0.
A5536C120003	8	23	12	3	2	6	2	2	6.7	1	1	1.25
A55360130005	8	21	23	3	2	6	2	2	9.5	1	1	1.75
A55380230007	2	22	22	2	2	6	16	2	8.8	1	2	0.75
A55380230002	2	9	22	2	2	6	16	2	11.2	1	2	0.75
A55380230004	8	23	10	3	2	6	18	2	10.3	1	1	2.00
A55380240013	1	23	11	3	2	6	2	1	9.9	3	2	0.
A55380240012	8	22	22	3	2	6	2	2	9.3	1	1	2.00
A55380240011	8	21	10	3	2	6	2	3	10.3	3	3	0.
A55380230005	2	22	22	2	2	6	16	2	8.8	1	2	0.75
A5538C230006	2	22	22	2	2	6	16	2	8.8	1	2	0.75
A5538C230008	2	22	22	2	2	6	16	2	8.8	1	2	0.75
A5538C230009	2	22	22	2	2	6	16	2	8.8	1	2	0.75
A55390210026	8	21	21	3	2	6	2	1	8.3	1	1	2.00
A55390210025	8	21	21	3	2	6	2	1	8.3	1	1	2.00
A55390220037	8	21	12	3	2	6	2	2	7.5	1	1	1.00
A55110120003	8	23	12	3	2	6	2	2	0.	1	1	1.50
A55130140005	8	24	22	3	2	13	2	2	0.	4	0	0.
A55130340006	2	9	22	2	2	6	2	1	0.	3	3	0.
A55210140003	8	9	12	3	2	2	2	2	0.	4	0	0.
A55220330001	8	17	17	2	2	6	2	2	0.	1	1	1.50
A55220230045	8	17	14	2	2	6	1	2	0.	1	1	1.50
A55220210007	8	22	22	2	2	6	2	2	0.	1	1	2.50
A55220130009	2	10	23	2	2	6	2	2	0.	3	3	0.
A55220210009	21	21	12	3	2	6	2	2	0.	2	1	1.50
A5522C220023	2	9	23	2	1	1	2	1	0.	4	0	0.
A55240140001	2	9	9	2	2	2	2	2	0.	4	0	0.
A55240130026	8	9	9	2	2	6	2	3	0.	1	1	0.
A55240240006	8	21	11	3	2	6	2	3	0.	3	3	0.

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55280130021	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55280240014	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55280240008	8	23	23	3	2	6	2	2	9.5	1	2	1.75
A55280140022	8	22	10	3	2	6	2	2	7.6	1	1	2.00
A55280140013	8	22	11	3	2	6	2	2	6.5	1	1	2.00
A55280240002	8	22	22	2	2	6	2	2	7.1	1	1	1.75
A55280140016	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280210005	8	9	11	3	2	6	2	1	8.8	1	1	0.
A55280240016	8	9	10	3	2	6	2	2	6.8	1	1	1.50
A55280130020	8	10	23	3	2	6	2	2	7.1	1	1	1.50
A55280240021	8	9	21	3	2	6	2	2	7.4	1	1	2.00
A55290230028	18	21	12	3	2	6	2	2	8.6	1	1	1.25
A55290230012	21	25	11	3	2	6	2	1	9.2	1	1	1.25
A55290220003	8	22	22	2	2	6	2	2	9.2	1	1	1.50
A55290130004	18	22	11	3	2	6	2	2	9.7	1	1	1.50
A55290210008	21	21	12	3	2	6	2	2	7.2	1	1	1.50
A55290230009	21	22	23	3	2	6	2	2	10.1	1	1	1.50
A55290240002	8	10	11	3	2	6	2	2	9.1	1	2	1.75
A55290230005	21	10	23	3	2	6	2	3	9.2	1	1	0.
A55290220004	21	23	12	3	2	6	2	2	9.2	2	1	1.25
A55290130005	18	23	12	3	2	6	2	2	10.1	2	1	1.50
A55290230010	21	10	21	3	2	6	2	1	5.6	1	1	1.25
A55290230006	18	25	23	3	2	6	12	2	9.0	1	1	1.50
A55290230003	21	10	12	3	2	6	2	1	6.2	3	3	0.
A55290230004	18	10	23	3	2	6	2	2	7.5	1	1	2.00
A55290230007	18	22	11	3	2	6	2	2	9.5	1	1	2.25
A55290210006	18	10	12	3	2	6	2	1	5.9	1	2	1.50
A55290230031	18	22	11	3	2	6	2	2	9.7	1	1	1.50
A55320310001	8	9	5	3	2	15	2	2	12.8	1	2	1.50
A55320120001	8	9	12	3	2	6	3	3	6.7	1	3	0.
A55330140001	8	22	10	3	2	6	2	2	9.9	2	2	1.00
A55340330002	8	22	22	2	2	6	2	1	8.2	3	3	0.75
A55340330001	8	22	22	2	2	6	2	1	8.2	3	3	0.
A55350120001	8	21	23	3	2	6	2	2	7.0	1	1	2.00
A55360130003	8	12	12	3	2	6	2	2	4.8	2	1	2.00
A55360110002	8	25	12	3	2	6	2	3	4.6	3	3	0.

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55260210003	8	22	22	2	2	6	2	2	6.6	1	1	1.50
A55260110025	8	17	10	3	2	6	2	2	6.7	1	2	1.75
A55260210001	8	10	11	3	2	6	2	3	8.6	1	1	0.
A55260110029	8	21	12	3	2	6	2	2	6.5	1	1	1.50
A55260120011	8	11	12	3	2	6	2	2	7.3	1	1	1.00
A55260140009	8	22	22	3	2	6	2	2	7.2	1	2	2.50
A55260230020	8	11	11	3	2	6	2	2	8.3	3	2	0.
A55260230003	21	10	11	3	2	6	2	2	7.7	1	2	2.25
A55260110024	8	10	17	3	2	6	2	2	5.7	1	2	1.50
A55270230001	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55270120019	8	10	23	3	2	6	2	2	6.6	1	1	2.00
A55270110015	8	22	22	2	2	6	2	2	8.0	1	1	1.00
A55270130021	8	9	11	3	2	6	2	2	5.3	1	1	2.00
A55270120014	8	10	12	3	2	6	2	2	7.9	1	1	1.25
A55270110001	8	9	11	3	2	6	2	2	7.5	1	2	1.75
A55270240015	8	9	11	3	2	6	2	2	7.2	1	1	1.00
A55270240016	8	23	12	3	2	6	2	2	6.8	1	1	1.50
A55270120020	8	22	11	3	2	6	2	2	6.6	1	1	2.00
A55270120017	8	10	11	3	2	6	2	2	8.7	1	2	1.25
A55270130025	8	22	22	2	2	6	2	2	8.8	1	1	2.00
A55270230002	8	24	24	2	2	6	2	1	7.0	1	2	1.25
A55270140001	8	10	11	3	2	6	2	2	7.4	1	2	1.50
A55270110013	8	22	11	3	2	14	2	2	6.5	1	2	1.50
A55270120013	8	10	23	3	2	6	2	2	5.9	1	1	1.25
A55270120021	18	21	12	3	2	6	2	2	10.9	1	1	1.50
A55270210016	8	24	22	3	2	6	2	2	9.3	1	2	2.00
A55270130024	8	10	21	3	2	6	2	2	5.3	1	2	1.50
A55270140017	8	11	23	3	2	6	2	2	6.1	1	1	1.00
A55270120018	8	10	23	3	2	6	2	2	6.6	1	1	2.00
A55270130026	8	9	11	3	2	6	2	2	7.2	1	1	1.00
A55270120022	18	21	12	3	2	6	2	2	10.9	1	1	1.50
A55270240012	8	23	12	3	2	6	2	2	9.0	1	1	1.50
A55270140018	8	21	23	3	2	6	2	2	7.1	1	1	2.00
A55270240011	8	23	12	3	2	6	2	2	9.0	1	1	1.50
A55270210007	8	23	12	3	2	6	2	2	6.7	1	1	1.25
A55270210005	8	23	12	3	2	6	2	2	6.7	1	1	1.25

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55270210008	8	23	12	3	2	6	2	2	6.7	1	1	1.25
A55270130023	8	23	12	3	2	14	2	2	8.6	1	1	1.25
A55270110012	18	21	12	3	2	6	2	2	9.8	1	1	1.50
A55270210006	8	23	12	3	2	6	2	2	6.7	1	1	1.25
A55270120016	18	21	12	3	2	6	2	2	9.8	1	1	1.50
A55270210014	8	11	23	3	2	6	2	2	7.9	1	1	1.25
A55270130027	8	23	23	3	2	6	2	2	7.0	1	1	1.50
A55270210017	18	10	12	3	2	6	2	2	11.5	1	1	1.75
A55270130020	8	9	11	3	2	6	2	2	7.7	1	1	2.00
A55270110014	8	21	21	3	2	6	2	2	6.8	1	1	1.75
A55280230009	10	50	0	0	0	0	0	0	0.	0	0	0.09
A55280230012	18	21	12	3	2	6	2	2	10.1	1	1	1.75
A55280220003	8	21	12	3	2	6	2	2	7.5	1	1	1.75
A55280230010	21	23	12	3	2	6	2	2	10.4	1	1	1.75
A55280130017	21	11	12	3	2	6	12	2	9.7	1	1	1.7[illegible]
A55280130016	21	21	12	3	2	6	2	2	10.5	1	1	1.75
A55280230011	18	11	21	3	2	6	2	2	10.6	2	1	1.50
A55280240018	8	10	12	3	2	6	2	3	8.8	3	1	1.50
A55280230007	18	10	12	3	2	6	2	2	11.1	1	1	1.75
A55280240020	8	11	11	3	2	6	2	2	8.9	1	1	1.75
A55280120003	21	21	23	3	2	6	2	2	8.1	1	1	1.50
A55280240015	18	9	22	2	2	6	2	2	9.7	1	1	1.50
A55280230008	8	11	11	3	2	6	2	2	8.7	1	1	1.50
A55280140026	8	22	22	2	2	6	2	2	6.8	1	1	1.50
A55280120004	8	10	23	3	2	6	2	1	7.2	3	1	0.
A55280240013	8	20	23	3	2	6	2	2	7.4	1	1	1.50
A55280240019	8	22	12	3	2	6	2	2	7.0	1	1	1.25
A55280140020	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280140018	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280140015	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280140017	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280140019	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280140021	8	21	11	3	2	6	2	2	6.0	1	1	2.00
A55280240017	8	9	10	3	2	6	2	2	6.8	1	1	1.50
A55280130018	8	10	23	3	2	6	2	2	7.1	1	1	1.50
A55280130019	8	10	23	3	2	6	2	2	7.1	1	1	1.50

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55230120025	8	22	22	3	2	6	12	2	13.8	1	1	2.50
A55230120029	8	9	9	2	2	6	2	2	7.0	1	1	2.00
A55230220005	8	21	12	3	2	6	2	2	8.0	1	1	1.75
A55230120027	8	8	8	3	2	6	2	2	8.8	1	1	2.00
A55230210017	2	11	9	2	2	6	2	3	9.0	1	1	1.50
A55230210019	2	10	11	3	2	6	2	2	6.6	1	2	0.
A55230240006	8	9	10	3	2	6	2	2	8.6	1	1	1.50
A55230230006	8	8	8	2	2	6	2	2	8.0	1	1	1.00
A55230120028	8	9	9	2	2	6	2	2	10.4	1	1	1.50
A55230010002	8	10	10	3	2	6	2	2	9.3	1	1	1.50
A55230010001	8	10	8	3	2	6	2	2	8.7	1	1	1.00
A55230030001	8	9	9	3	2	6	2	2	8.6	1	1	2.00
A55230220006	8	10	12	3	2	6	2	2	8.0	1	1	1.00
A55240230012	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240130012	8	10	21	3	2	6	2	2	6.4	1	1	1.50
A55240230017	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240230018	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240110006	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240230015	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240230014	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240130023	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240120005	8	11	10	3	2	6	12	2	6.7	1	1	1.50
A55240230005	8	10	10	3	2	6	12	2	7.2	1	1	1.75
A55240230011	8	10	10	3	2	6	12	2	6.9	1	1	2.00
A55240230010	8	9	12	3	2	6	2	2	7.1	1	2	1.50
A55240230006	8	10	10	3	2	6	12	2	7.2	1	1	1.75
A55240130025	8	10	9	3	2	6	12	2	9.3	1	1	1.75
A55240230008	8	11	11	3	2	6	2	2	7.7	1	1	2.50
A55240120006	8	11	10	3	2	6	12	2	6.7	1	1	1.50
A55240230007	8	10	10	3	2	6	12	2	7.2	1	1	2.00
A55240130024	8	10	12	3	2	6	2	2	8.3	1	1	1.50
A55240210003	8	8	9	2	2	6	2	2	9.2	1	1	2.25
A55240130007	2	8	8	2	2	6	1	2	5.6	3	1	0.
A55240130014	8	11	11	3	2	6	2	2	6.9	1	1	0.
A55240240007	8	9	10	3	2	6	2	1	8.3	3	3	0.
A55240130009	8	11	11	3	2	6	2	2	8.1	1	1	1.75

Table 5.A1.

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55240230027	8	11	11	3	2	6	2	2	7.1	1	1	1.75
A55240240003	8	11	11	3	2	6	2	2	8.1	1	1	2.25
A55240230013	8	10	9	3	2	6	2	2	7.8	3	1	0.
A55240230016	8	8	22	2	2	6	2	2	8.3	1	1	1.75
A55240130010	8	10	9	3	2	6	2	3	7.6	3	1	0.
A55240230009	2	11	11	3	2	6	2	2	9.9	1	2	0.
A55240130018	8	9	9	2	2	6	2	2	7.6	1	1	0.
A55240210002	8	22	9	3	2	6	2	2	7.0	1	1	2.00
A55240230020	2	22	22	2	2	6	2	2	9.4	1	1	1.75
A55240230019	8	10	11	3	2	19	2	2	5.5	4	0	0.
A55240230021	2	9	9	2	2	6	2	2	5.2	1	2	2.00
A55250220001	8	10	11	3	2	6	12	2	5.7	3	1	0.
A55250140005	8	8	22	2	2	6	2	2	7.4	1	2	2.50
A55250140009	8	8	22	2	2	6	2	2	7.4	1	2	2.50
A55250140001	8	9	8	3	2	6	2	2	7.9	1	1	2.25
A55250140006	8	8	22	2	2	6	2	2	7.4	1	2	2.50
A55250230001	8	9	22	2	2	6	2	2	8.2	1	1	2.00
A55250130002	8	21	24	2	2	6	2	2	7.8	1	1	1.75
A55250120002	8	26	18	3	2	4	2	2	8.6	4	0	0.
A55260230018	8	27	9	2	2	10	2	3	9.2	3	1	0.
A55260110027	8	9	9	3	2	6	2	3	5.9	1	1	1.25
A55260240020	8	11	21	3	2	6	12	2	7.4	1	1	1.50
A55260110026	8	11	11	3	2	6	2	2	8.6	1	1	2.00
A55260210015	8	22	22	2	2	6	2	2	7.7	1	1	1.50
A55260230014	8	11	11	3	2	6	2	2	7.9	1	2	1.75
A55260240017	8	11	21	3	2	6	12	2	7.4	1	1	1.50
A55260240018	8	11	21	3	2	6	12	2	7.4	1	1	1.50
A55260240019	8	22	22	2	2	6	2	2	7.7	1	1	1.50
A55260230013	8	10	10	3	2	6	12	2	7.4	1	2	1.75
A55260220009	8	22	22	2	2	6	2	2	7.5	1	2	1.50
A55260220001	8	10	11	3	2	6	2	2	7.1	1	2	2.50
A55260120013	8	10	11	3	2	6	2	2	7.8	1	1	1.50
A55260240021	8	11	23	3	2	6	2	2	9.1	1	2	1.25
A55260120009	8	9	9	2	2	6	2	1	8.0	3	2	0.
A55260130005	8	12	10	3	2	6	2	2	8.5	1	1	1.75
A55260240022	8	23	23	3	2	6	2	2	12.3	1	2	1.75

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55170220001	8	22	22	2	2	6	2	1	4.7	3	1	0.
A55180240002	8	22	22	3	2	6	2	2	8.6	1	1	2.50
A55180230005	8	9	9	2	2	6	2	2	6.4	1	1	0.
A55180240003	8	9	9	3	2	6	2	2	8.5	1	1	2.50
A55180340002	8	10	11	3	2	1	2	1	8.0	3	3	0.
A55180220004	8	11	9	3	2	6	2	3	11.0	3	3	0.
A55190140002	8	11	9	2	2	6	2	2	8.3	1	1	2.00
A55190330004	8	9	9	3	2	6	2	2	5.9	1	1	1.50
A55190110003	8	9	12	3	2	6	2	2	7.4	1	1	1.50
A55190110004	8	9	12	3	2	6	2	2	7.4	1	1	1.50
A55190130007	8	9	11	3	2	6	2	2	7.6	1	1	2.00
A55190140001	8	11	10	3	2	6	2	1	6.0	3	3	0.
A55190220003	8	12	12	3	2	6	2	2	6.3	1	1	1.00
A55190130006	8	9	11	3	2	6	2	2	7.6	1	1	2.00
A55200240006	8	10	11	3	2	6	2	2	8.0	1	2	2.00
A55200130003	8	9	12	3	2	6	2	2	6.6	1	1	1.50
A55200240007	8	9	9	3	2	6	2	2	9.3	1	1	2.50
A55200140003	8	10	11	3	2	6	2	2	6.6	2	1	1.50
A55200140002	8	10	11	3	2	6	2	2	7.1	1	1	1.50
A55200210004	8	10	2	3	2	6	2	2	6.5	1	1	1.50
A55200120007	8	22	22	2	2	6	2	2	7.7	1	1	1.50
A55200220006	8	9	11	3	2	6	2	2	8.1	1	2	1.50
A55210330004	8	9	8	3	2	6	2	2	8.5	1	1	1.50
A55210220006	8	18	18	3	2	6	2	2	7.2	1	1	1.50
A55210320003	8	19	10	3	2	6	2	2	8.3	1	1	2.00
A55210140004	8	11	9	2	2	6	2	2	8.8	1	1	2.00
A55210210009	8	10	9	3	2	6	2	2	8.7	1	1	2.00
A55210340008	8	8	8	3	2	6	2	2	6.5	1	1	2.00
A55210110009	8	9	10	3	2	6	2	2	7.7	1	1	2.00
A55210110006	8	17	20	3	2	6	2	2	7.6	1	2	1.50
A55210130005	8	9	9	3	2	6	2	1	7.5	3	3	0.
A55210310006	8	9	12	3	2	6	2	2	6.4	1	1	1.50
A55210110008	2	10	9	3	2	6	1	2	5.9	1	1	1.50
A55220230023	8	9	11	3	2	6	2	2	8.6	1	1	1.50
A55220340005	8	9	9	3	2	6	12	2	8.4	1	1	2.00
A55220340002	18	17	12	3	2	6	2	2	11.0	1	1	1.50

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
A55220230046	18	14	12	5	2	1	2	1	9.0	3	3	0.
A55220210005	8	12	11	5	2	6	2	3	11.9	3	2	0.
A55220230037	8	8	9	5	2	6	2	2	7.7	1	1	1.50
A55220230017	8	12	20	5	2	6	2	2	7.7	1	2	1.50
A55220210006	18	12	23	5	2	6	2	2	8.7	2	1	2.25
A55220210008	8	21	22	5	2	6	2	2	9.4	1	1	1.75
A55220220026	8	10	12	5	2	6	2	2	7.4	1	2	1.50
A55220110001	8	10	9	5	2	6	2	2	8.8	1	2	1.50
A55220120027	8	9	11	5	2	6	2	2	6.8	1	1	1.50
A55220220028	8	10	10	5	2	6	2	2	7.4	1	1	2.00
A55220240005	8	10	12	5	2	6	2	2	7.7	1	1	1.50
A55220230020	8	10	12	5	2	6	2	2	7.7	1	1	1.50
A55220230043	8	8	9	5	2	6	2	2	7.7	1	1	1.50
A55220110002	8	10	9	5	2	6	2	2	8.8	1	2	1.50
A55220130008	8	17	14	2	2	6	1	2	5.0	1	1	0.75
A55220340006	8	10	11	5	2	6	2	2	8.0	1	1	1.50
A55220340003	8	8	8	2	2	6	2	2	9.0	1	1	1.50
A55220230042	8	11	11	5	2	6	2	2	6.0	1	1	1.50
A55220130012	8	8	8	2	2	6	2	2	7.0	1	1	1.00
A55220220027	8	10	10	5	2	6	2	3	6.1	1	1	1.50
A55220220023	8	10	14	5	2	6	1	2	7.2	1	2	1.50
A55220230044	8	11	11	5	2	6	2	2	9.5	1	1	2.00
A55220220022	8	11	9	5	2	6	12	2	5.7	1	2	1.00
A55220340004	2	10	8	2	2	6	2	1	10.0	3	3	0.
A55220230019	8	17	14	2	2	6	1	2	5.0	1	1	0.75
A55220230038	8	9	8	2	2	6	2	3	8.6	1	3	0.
A55220220029	8	14	11	5	2	6	2	1	7.3	3	3	0.
A55220210004	8	14	14	2	2	1	1	1	6.0	3	3	0.
A55220120022	2	14	14	2	2	1	1	1	5.8	3	3	0.
A55230120031	8	10	9	5	2	6	2	2	6.6	1	1	1.50
A55230130018	8	9	11	5	2	6	2	2	7.4	1	1	1.50
A55230230013	8	9	11	5	2	6	2	3	6.0	1	1	1.75
A55230230010	8	10	12	5	2	6	12	2	9.6	2	1	1.75
A55230230009	8	10	12	5	2	6	12	2	9.6	2	1	1.75
A55230230004	8	23	12	5	2	6	2	2	6.1	1	1	1.50
A55230210016	8	8	8	5	2	6	2	2	8.2	1	1	2.50

Table 5.A1. (continued)

Artifact #	Temper	Ex. Color	In. Color	Carbon Streak	Finish	Ex. Treat.	In. Treat.	Smooth Ex.	Thk. (mm)	Cord Twist	Cord Place.	Cord Thk.
AS5250110002	8	22	22	2	2	6	2	3	0.	3	3	0.
AS5250130006	8	11	11	3	2	6	2	3	0.	1	1	2.00
AS5260110022	2	22	22	2	2	6	2	2	0.	3	3	0.
AS5260230012	8	23	11	3	2	6	12	2	0.	1	1	2.00
AS5260220003	8	24	24	2	2	6	2	2	0.	1	1	1.75
AS5260220002	2	9	22	2	1	1	2	1	0.	4	0	0.
AS5260230015	2	8	8	2	2	6	2	3	0.	3	3	0.
AS5270130014	8	9	22	2	2	6	2	2	0.	3	1	0.75
AS5270210009	2	9	9	2	1	1	2	1	0.	4	0	0.
AS5270240017	2	22	22	2	1	1	2	1	0.	4	0	0.
AS5270140011	2	18	8	2	1	1	2	1	0.	4	0	0.
AS5270130022	18	23	23	3	2	6	2	2	0.	2	1	2.00
AS5280220002	2	10	10	2	2	6	2	2	0.	1	1	1.75
AS5280140012	8	22	22	2	2	6	2	3	0.	1	1	0.
AS5290230030	18	23	12	3	2	6	2	2	0.	2	1	1.50
AS5290230002	18	23	23	3	2	6	2	2	0.	2	1	1.75
AS5360140002	2	9	22	3	2	6	2	2	0.	1	1	1.00
AS5380230003	2	9	9	2	2	17	2	1	0.	1	3	0.75
AS5380220014	8	10	10	3	2	6	2	2	0.	1	1	1.50
AS5110120004	8	23	12	3	2	6	2	2	0.	1	1	1.50
AS5110120005	8	23	12	3	2	6	2	2	0.	1	1	1.50
AS5110120001	8	23	12	3	2	6	2	2	0.	1	1	1.50
AS5110120002	8	23	12	3	2	6	2	2	0.	1	1	1.50
AS5260240002	8	17	17	2	2	6	2	2	0.	1	1	1.50
AS5220240006	8	17	17	2	2	6	2	2	0.	1	1	1.50
AS5220230032	8	17	17	2	2	6	2	2	0.	1	1	1.50
AS5220240004	8	17	14	2	2	6	1	2	0.	1	1	1.50
AS5220240010	8	17	14	2	2	6	1	2	0.	1	1	1.50
A00000860601	8	21	11	3	2	6	2	3	0.	3	3	0.
AS5270120010	8	9	22	2	2	6	2	2	0.	3	1	0.75
AS5270130017	8	9	22	2	2	6	2	2	0.	3	1	0.75
AS5390120002	2	10	10	2	2	6	2	2	0.	1	1	1.70

Table 5.A2. Variable codes for Table 5A1.

Temper:

1. Indeterminate
2. Absent
5. Grit
7. Limestone
8. Bone
18. Bone and Indurated Clay/Sherd
21. Indurated Clay/Sherd
25. Charcoal, Grit, and Bone

Exterior and Interior Color:

1. 7.5YR 7/4 Pink
2. 7.5YR 6/4 Lt. Brown
5. 7.5YR 3/0 Very Dark Grey
7. 10YR 8/6 Yellow
8. 10YR 7/4 Very Pale Brown
9. 10YR 6/3 Pale Brown
10. 10YR 5/2 Grayish Brown
11. 10YR 4/1 Dark Gray
12. 10YR 3/1 Very Dark Gray
14. Indeterminate
17. 5YR 6/6 Reddish Yellow
18. 10YR Lt. Brownish Gray
19. 10YR 7/1 Lt. Gray
20. 10YR 6/1 Gray
21. 10YR 5/3 Brown
22. 10YR 6/4 Lt. Yellowish Brown
23. 10YR 4/2 Dk. Grayish Brown.
24. 7.5YR 6/6 Reddish Yellow
25. 7.5YR 5/4 Brown
26. 10YR 7/2 Lt. Gray
27. 10YR 7/3 Very Pale Brown
28. 2.5YR 6/6 Lt. Red

Carbon Streak:

2. Absent
3. Present

Finishing Technique:

1. Indeterminate
2. Paddle-and-Anvil

Table 5.A2. (continued)

<u>Exterior and Interior Surface Treatment</u>:

1. Indeterminate
2. Floated
3. Polished
4. Slipped
6. Cordmarked
10. Cordmarked and Slipped
12. Scraped with Firm, Smooth Tool
13. Incised
14. Cordmarked and Incised
15. Cordmarked and Striated
16. Unfinished
17. Cordmarked and Brushed
18. Brushed and Floated
19. Striated

<u>Smoothing over Exterior Surface Treatment</u>:

1. Indeterminate
2. Absent
3. Present

<u>Cord Twist</u>:

1. S
2. Z
3. Indeterminate
4. Absent

<u>Cord Placement</u>:

1. Parallel
2. Criss-Crossing
3. Indeterminate

Table 5.A3. Provenience data for materials recovered from flotation, 14BU55.

Unit	N	Bone[a]	Char-coal[a]	Burned Earth[a]	Daub[a]	Chert[a]	Lime-stone[a]	Sand-stone[a]	Pottery	Number of Charred Iden-tified Flora	Number of Charred Uniden-tified Flora
A5510018-SE	1					.1					
A5510039-1	1		.2			.1					
A5510048-SE	1		.2								
A5510058-NE	1	.1				.1					
A5510058-SE	1	.1			2.9	.3					10
A5510068-SW	1										1
A5510078-SE	1	.1	.1		.1	.3				5	
A5510078-SW	1		.1		.1						
A5510088-NE	1					.1				2	6
A5511039-4	1		.1			.4					
A5511038-NW	1	.1	.1			.8				2	1
A5511038-NE	1		.1								
A5512028-NE	1		.1								
A5512038-NW	1	.4				.1					
A5514038-NW	1	.1	.1	.1	.1	1.8					
A5514038-NE	1	.1	.3			2.3				2	
A5514038-SW	1	.2	.3	.1	.1	1.9					
A5514038-SE	1	.1	.4		.1	3.2					
A5515028-SW	1	.1									
A5516028-SE	1	.1			9.3	.4					
A5516028-SW	1		.1		.8	.7					
A5517028-NW	1	.1	.1		.1	.1					
A5517029-6	1	.1	3.5		.8	.1				6	
A5518028-SE	2	.1	.2		1.3	2.0				8	12
A5518028-SW	1	.1		.1	.1	.1					
A5519028-NW	1					.2					
A5519028-NE	1	.1	.2		.5	.7				1	8
A5519028-SE	1		.1	.1	.1	2.7					
A5519038-NE	1	.1				.3					
A5519038-SW	1		.2							1	
A5520028-NW	2	.2	.2		.8					7	1

Table 5.A3. (continued)

Unit	N	Bone[a]	Char-coal[a]	Burned Earth[a]	Daub[a]	Chert[a]	Lime-stone[a]	Sand-stone[a]	Pottery	Number of Charred Identified Flora	Number of Charred Unidentified Flora
A5520038-SW	1	.1	.1		.1	2.9					
A5520038-NW	2	.1	.2		.4	1.2					6
A5520038-SE	1		.1							2	9
A5521038-NE	2	.1			3.8	2.0				17	
A5521028-SW	2	.3	.2		.1	.1				2	
A5521028-SE	1	.1	.1		1.0	.2					
A5521029-SE/SW	7	.5	.7	2.1	11.3	3.6				8	32
A5522018-NW	2	.3			572.2	21.1			3.6	31	
A5522018-NE	6	2.6	.1		954.9	52.5	12.0	2.0		3	1
A5522018-SW	12	6.6	2.8	6.9	2222.0	176.1			1.8	16	
A5522018-SE	2	1.0	.7	20.1	418.0	7.1	11.9			16	
A5522028-NW	11	2.9	.4		2392.5	50.9		1.5		29	
A5522028-NE	1	.2		6.8	13.5	5.0				1	
A5522028-SW	3	2.3	.2	72.2	43.7	34.0			12.0	82	
A5522028-SE	1	.6	.6	6.1	17.5	12.3			4.7	13	2
A5523018-SW	2	1.5	.4	3.8	64.8	13.9				24	1
A5523018-SE	2	3.4	2.2	4.0	13.2	4.5			2.5		1
A5523028-NW	6	8.8	10.1	77.0	138.5	22.0	22.0	12.0	.8	131	160
A5523028-NE	1	.4	.3		10.4	11.5	11.1			35	4
A5523028-SW	2		.6	3.5		6.4		8.5		33	2
A5523028-SE	1	.4	.1	3.9		4.5					
A5524018-NE	1	.2	.2		2.7	.3					
A5524018-SE	1	1.2	.1	5.4	.6	18.7				23	
A5524028-SW	1	.1	.2			2.6					
A5524028-SE	1					17.7					
A5524028-NW	1				5.5					1	
A5525028-NW	1	.1	.2							3	
A5525028-NE	1		.1								
A5526018-NW	2	.3	.2		1.4	.3					
A5526018-NE	2	.9	1.0		5.0	5.5				3	
A5526018-SW	1	.2	.4	.3	.4	1.3				51	5
A5526018-SE	2	.3		2.0	1.3	5.7			8.3	23	83
A5526028-NW	3	3.4	2.8		7.0	87.0			4.6	61	8
A5526028-NE	1	.3	1.8		.8	6.6				514	
A5526028-SW	1	.8	1.0	4.4	8.6	16.2			14.3	102	

Table 5.A3. (continued)

Unit	N	Bone[a]	Char-coal[a]	Burned Earth[a]	Daub[a]	Chert[a]	Lime-stone[a]	Sand-stone[a]	Pottery	Number of Charred Iden-tified Flora	Number of Charred Uniden-tified Flor
A5526028-SE	1	.7	1.6		3.0	10.7				2	
A5527018-NE	2	2.5	5.4	.9		41.0			6.8	31	
A5527018-SW	2	5.4	5.9	7.3	7.9	84.3			18.3	405	
A5527018-SE	2	2.6	3.0		7.7	12.0	11.1	7.0		18	3
A5527018-NW	1						12.8				
A5527028-NE	1		1.8	4.8	8.3	5.2					
A5527028-SE	1					5.6			19.3		
A5528029-18	1					.4					
A5528018-NE	1	.3	1.2	.5		1.3			3.8	24	1
A5528018-SW	1	.4	1.4	.7		4.3	10.7			112	
A5528028-NE	1	.2	1.0		.6	1.2				11	
A5528028-SE	1		.4	.8	.2	1.4	10.3			1	
A5529019-14	1	.3	13.6			.1					
A5529028-SE	1	.1	.2		.2	.1		1.0	1.2		2
A5529028-SW	1	.5	.2	.2		.1					30
A5532018-NE	1		.1	.1	.1	.1					
A55320180SW	1	.1	.1								8
A55320280NE	1	.1	.1	.1		.2					
A5533018-NW	1	.1	.1		.4	.1					
A5533029-13	1		.5		.6						
A5533018-NE	1		.1								
A5533028-NW	1	.1	.2		.1	.1					
A5533028-SE	2	.1	.2		.1	.4					
A5534028-SE	1		.1			.5					
A5534028-SW	1		.2							21	
A5534028-SE	1		.2		.2						2
A5535029-16	1	.3	.2	.1		2.2					
A5535029-17	1	.1	.2	.1		.7					
A5535028-SW	1		.2							4	10
A5536028-SE	2		.8	.6	2.4	1.1				22	1
A5536018-NW	1		.1		.6					28	
A5536018-SW	1	.3	.1		.1					5	1
A5537018-NE	1		.1			.1					
A5537018-NW	1	.1	.2		.1	.1					2

Table 5.A3. (continued)

Unit	N	Bone[a]	Char-coal[a]	Burned Earth[a]	Daub[a]	Chert[a]	Lime-stone[a]	Sand-stone[a]	Pottery	Number of Charred Iden-tified Flora	Number of Charred Uniden-tified Flora
A5537028-SE	1	.2	.2	.1	.3	.3				13	
A5538018-SW	8	6.6	.1	78.1	1664.9	16.1					
A5538028-NW	1	3.3	.8	9.3	193.5	13.5				952	2
A5538028-NE	1	7.7	1.0	26.8	268.0	16.0				52	4
A5538028-SE	6	5.1	1.4	50.3	2146.5	222.3				26	50
A5538028-SW	4	35.5	6.9	1.6	661.2	119.0			3.4	361	5
A5539018-SE	2	3.5	.7		21.8	81.3				50	1
A5539018-SW	1		.1	3.5	35.6	50.2	11.5			39	1
A5539028-NW	4	2.5	1.2	7.0	802.5	170.9				91	13
A5539028-NE	3	.4	.9		54.2	136.2			4.3	25	69
A5539028-SE	4	3.7	5.2	13.2	143.1	148.7			1.4	646	1100
A5539028-SW	1	1.4	.8	20.5	708.9	33.3				21	5
Total	195	126.5	93.5	445.4	13661.5	1801.7	113.4	32.0	111.1	4218	1663

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CHAPTER 6

PALEOETHNOBOTANICAL ANALYSIS OF WOODLAND COMPONENTS ON 14BU9 AND 14BU31

Matthew J. Root

Abstract

A series of multiple working hypotheses are proposed and tested to determine what processes were responsible for the introduction of carbonized botanical remains into the cultural deposits at 14BU9 and 14BU31. Plant remains may be present due to various combinations of human and natural agencies. The absence of off site testing for natural seed rain limits testing of the hypotheses. However, black walnuts were probably used at 14BU9 during the Woodland occupations and hickory nuts, chenopods, and several other plants were utilized during the occupations of 14BU31.

Introduction

The major research orientation of current studies in the El Dorado area is investigation of the interrelationships among the various subsistence and settlement systems operative in the past (Leaf 1976). Toward achievement of this goal, soil samples were taken from two Woodland components. Limited sampling was carried out on 14BU31, while 14BU9 was extensively sampled. Soil samples were taken to recover flora, small faunal remains and other microdebris that would pass through conventional field screens.

14BU31 was test excavated in 1977; investigations are thoroughly described by Leaf (1979). The site represents the remains of a small Woodland base camp, located along the Walnut's west bank. Cultural debris is scattered over a 1.0 ha. area, but river meandering may have destroyed as much as half the site. Limited investigations consisted of excavating two 2 by 2 m. test units and digging three backhoe trenches (Fig. 6.1). Stone tools made of local and exotic cherts; limestone tempered, cord marked ceramics; food remains and cooking facilities were present. Possible subsistence items include fish, molluscs, rabbit, seeds, and nuts. Activities carried out at or associated with the site include food preparation and consumption, tool manufacture, wood working, hide scraping, hunting, and butchering. Ceramic vessels may have been used for food preparation and/or storage. Inferred activities indicate a hunting and gathering subsistence mode. A date of 1215 ± 55 radiocarbon years: A.D. 735 (UGa 2560) was obtained from a wood charcoal sample recovered from feature 302.

The Snyder site, 14BU9, was excavated from 1968 to 1971 under the auspices of the Museum of Anthropology, University of Kansas. One Woodland, three Archaic, and one deeply buried component of unknown cultural affiliation were uncovered. No floral remains were recovered from the Woodland deposit during these investigations. In 1978 study of the Snyder site was

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renewed; results are found in Leaf (Chapter 4, this volume). A 10 by 10 m. block was excavated with an intact subplowzone Woodland deposit located only in the west 5 by 10 m. area.

Analytical Framework

To meaningfully analyze botanical remains from archeological sites, processes responsible for their inclusion in a cultural deposit must be determined. In general, carbonized seeds and nuts (excluding aboriginal cultigens for the moment) can be introduced into cultural deposits in four ways: (1) as a result of food preparation, consumption, and/or disposal, or other resource exploitation activities; (2) as a consequence of local flora being carbonized and deposited by prehistoric man's activities other than resource exploitation; (3) as a result of natural agencies operative in the past; and (4) by modern contamination. Without a knowledge of how the archeological record was formed, statements which assign meaning to observations of that record become tenuous at best.

These propositions can be stated as a set of multiple working hypotheses with a series of implications against which quantitative, qualitative, and associational data may be compared in order to determine remains' origins. It should be mentioned at the outset that not all implications, when true, indicate that a single process was operative, if taken one at a time; and that vagaries exist in the meaning of some quantitative data. The hypothesis that carbonized seeds and nuts represent remains of plants utilized for food (or other uses, e.g., medicine) will be examined first.

If carbonized seeds do represent food remains, then the following set of relations should be observed. Remains are present in significantly greater quantity than in samples from culturally unmodified deposits. If seeds, nuts, and fruits are gathered for consumption, they should occur in aggregates larger than those resulting from natural processes. Large numbers of seeds can be charred during parching for storage. An extreme example of this is at the Newbridge site in the lower Illinois River valley where 4,700,000 Polygonum and Chenopodium seeds were recovered from two pits (Asch, Ford, and Asch 1972:14). Lesser, but still substantial numbers can fall into a fire during preparation for consumption or inedible parts, e.g., nut hulls, may be discarded into a hearth. Whatever the exact behavioral mechanisms, seeds would be preserved in larger numbers than if they were introduced by seed rain or the fortuitous carbonization of seeds already on the ground. Seeds present will also exhibit qualitative differences from off site samples. Human groups usually select certain foods from the wide variety available and these may be gathered from different resource zones. It is also unlikely that inedible seeds would be collected in large numbers, although a few might be present which reflect medicinal or nonfood resources. For example, five pokeweed seeds (Phytolacca americana L.) were found in a coprolite specimen from Salts Cave and since most parts of the plant are poisonous, a medicinal use was inferred (Yarnell 1969:44). Gilmore (1977:47) reports that Euphorbia serphyllifolia was used medicinally among the Ponca and Omaha; it too is poisonous (Steyermark 1963:984). These factors will lead to qualitative differences between cultural and noncultural samples.

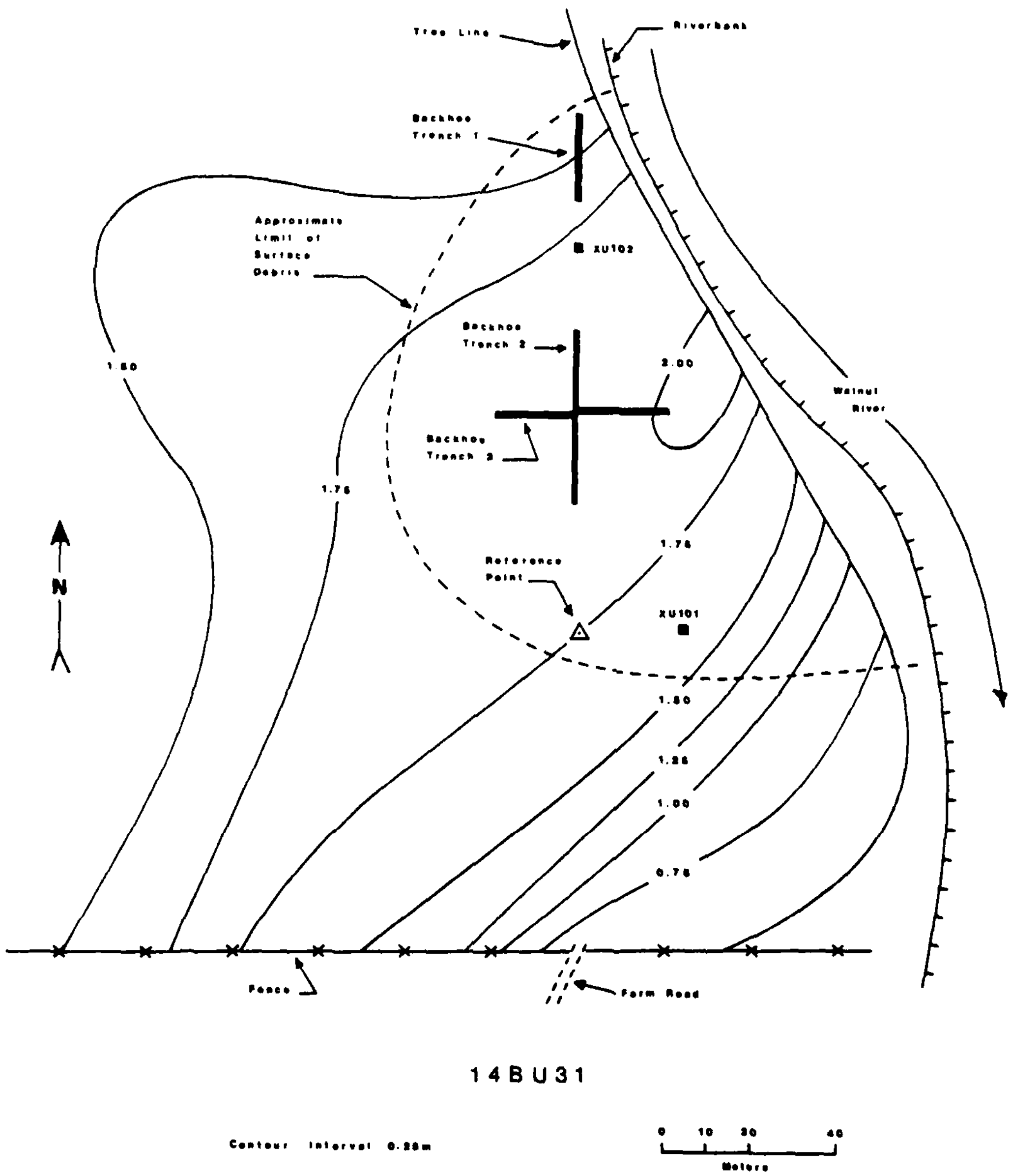

Figure 6.1. Contour map of 14BU31 showing locations of test excavation units and backhoe trenches (from Leaf 1979, Figure 4.3).

Seed associations are also important in determining mechanisms responsible for carbonization and deposition. Remains associated with cooking facilities or cleaning debris dumps are more likely to be food items than remains from general midden deposits. However, if midden samples, as a whole, do not differ qualitatively from hearth or roasting pit samples, they probably also represent food remains. If seeds represent utilization, there should be differential quantitative and qualitative distributions exhibited between food processing features and features unrelated to food preparation or consumption, e.g., chert heat treating stations. However, these areas are not always mutually exclusive.

The second hypothesis is that remains represent flora carbonized by fires set by past inhabitants of a site (e.g., campfires, fires set to clear underbrush), and are thus associated with the human occupation, but were not utilized. An implication of this statement is that seeds and/or nuts will be preserved in low quantities, but in greater frequencies than in off site samples. Additional opportunities for carbonization offered by man-made fires would result in more charred plant remains being present in on site samples than in noncultural samples, but less than if seeds were brought to a site in large numbers for food. In the absence of selective utilization, taxa present on and off a site should be qualitatively similar, all taxa recovered must have grown in the area of a site, and inedible species may occur in quantities comparable to other seeds. The last implication of this hypothesis is that seeds should covary in density with other cultural debris, especially material that has been burned, e.g., charcoal, burned earth, and burned limestone. However, there should not be significant differences between samples of varying functional origin, e.g., a meat roasting pit and a chert heat treating station.

The third hypothesis is charred seeds and/or nuts are present due to natural forest or prairie fires and thus, may or may not be contemporaneous with a past occupation. The fact that nonhuman agencies can be responsible for deposition of carbonized flora is illustrated by the recovery of several hundred charred seeds from one zone at Kirchner marsh (Watts and Winter 1966:1350). If natural fires resulted in deposition of carbonized seeds, there would be no significant quantitative or qualitative differences between on and off site proveniences. Also, there would be no patterned distribution of seeds within the site and especially no clustering in and around cultural features.

The last hypothesis is carbonized remains represent modern contamination. Implications of the third hypothesis concerning quantitative and qualitative relationships among samples and distributions of remains will hold true if this hypothesis is true. In addition, if modern domesticated species and/or introduced taxa are present, contamination is clearly indicated. With few exceptions (e.g., calcareous <u>Celtis</u> spp. shells) uncharred seeds in nonwaterlogged, open sites will quickly decompose, whereas charcoal may be preserved indefinitely in wet or dry conditions unless it is exposed to very high temperatures or abrasive mechanical action (Helbaek 1969:209). Therefore, uncarbonized flora represents recent contamination (cf. Keepax 1977:227).

It is realized that the above set of multiple working hypotheses is

not without ambiguity. Processes responsible for seed deposition do not operate in isolation. For example, contamination is possible in many cultural deposits, especially shallow ones. Therefore, the presence of crop or non-native seeds in samples does not imply all seeds are of modern origin. Another instance of two processes resulting in seeds being preserved is prehistoric seed rain being charred in hearths in conjunction with culturally introduced seeds. It is possible that all processes may be responsible for deposition of carbonized plants in a given sample.

The problem of determining how many seeds must be present before utilization can be reliably determined still remains. If only a few seeds of a given taxon occur in a feature (given that significantly fewer carbonized seeds occur in off site samples), does this mean they were deposited by natural seed rain, utilized only intermittently, or used a great deal, but simply not preserved? In an analysis of carbonized flora from the Mitchell Site, an Initial Middle Missouri village in South Dakota, some remains were present in low quantity (Benn 1974). A single tobacco seed (Nicotina rustica L.) from House 3 and seven from House 4 were recovered; because tobacco is a cultigen not native to the Plains, utilization is undeniable. One squash seed (Cucurbita pepo L.) from House 3 and two from House 4 (plus some rind) were recovered from three trash-filled pits. Although seed frequency is low, because squash is a cultigen, utilization is certain. These data indicate that seeds cannot be assumed, ipso facto, to be insignificant because they occur in small numbers. In spite of this, other seeds, less certainly associated with man, that were recovered in small numbers were considered to be of questionable significance (Benn 1974:61).

Currently there seem to be no clear cut solutions. However, as indicated by the hypotheses outlined above, the situation is not without partial resolve. Samples may be compared; for example, if a series of cooking facilities each yielded qualitatively similar lists of remains, utilization can be inferred with good probability. Other data from a site are important in assigning meaning to plant remains. If seeds and nuts were eaten, manos, metates, nutting stones, and/or other preparation implements should be present. Analysis of different sites of comparable seasonality and activity composition might show similar plant remains indicative of similar exploitative strategies. For example, if black walnuts, hickory nuts, and chenopod seeds are consistantly recovered from Woodland base camps, utilization is indicated.

Techniques

Sampling strategies and processing techniques differed slightly between 14BU9 and 14BU31 and are, therefore, discussed separately. At 14BU9. a 17.5 liter (½ bushel) soil sample was collected from each subplowzone excavation unit (1 by 1 m. by 10 cm.) and the entire matrix of concentrations and features was processed; sample volumes are given in Table 6.1, (volumes given for features are compact soil volumes computed from feature dimensions, those for concentrations and excavation units are for loose soil measured in ½ bushel baskets). Samples were processed using a slightly modified version of the water flotation and screening machine described and illustrated by Watson (1976:88-99). This procedure yields light and heavy fractions; light fractions were caught in a number 40 geologic screen (0.7 mm^2 mesh) and heavy

Table 6.1. Volumes of water flotation and screening samples from 14BU9.

Provenience	Volume (l.)
General Excavation Units	17.5
F360	2.5
F378	2.5
F381	1.0
F382	0.1
F385	1.0
F397	0.5
F405	0.1
Charcoal Concentration (482N497W, 483N497W)	100
Artifact Concentration (481N499W, 30-40 cm.)	60

fractions were caught in a 2.5 mm^2. mesh (1/16 inch) window screen. Some samples were air dried before flotation; separated light and heavy fractions were dried in the laboratory.

Charred and uncharred floral remains were separated using a binocular microscope set on low (10X) magnification. Light and heavy fractions were inspected, both contained carbonized flora. Some carbonized nutshells do not float in water, seeds often become trapped in unsuspended soil aggregates, and some wood charcoal becomes waterlogged during flotation, thus necessitating looking through both fractions for carbonized flora. Seeds and nutshells were identified with the use of seed manuals (Martin and Barkley 1961; Musil 1963) and comparative collections at the State of Kansas Biological Survey and Museum of Anthropology, University of Kansas. Identifications were confirmed by Dr. Ronald McGregor, Director of the State of Kansas Biological Survey.

In the case of 14BU31, the entire matrix of all features was collected and samples were taken from levels 2 and 3 (20-30 cm. and 30-40 cm. below ground surface) in XU102; no samples were taken from off the site. Sample size for each provenience is given in Table 6.2 (sample volumes were calculated in the same manner as for 14BU9). Samples were processed in the laboratory by water flotation and screening. Soil was suspended in water; all floating material was removed. The remaining matrix was first screened through a 2.5 mm^2 (1/16 inch) window screen and then through a number 40

Table 6.2. Volumes of water flotation and screening samples from 14BU31.

Provenience	Volume (l.)
XU102, 20-30 cm.	17.5
XU102, 30-40 cm.	17.5
F302	60
F304	55
F305	2

geologic screen (0.7 $mm.^2$ mesh). Light and heavy fractions were inspected with a magnifying lamp and separated into raw material classes (e.g., chert, limestone, charcoal, seeds). Identifications were accomplished by the same procedure used for 14BU9.

Paleobotanical Analysis

14BU9

Carbonized plant remains were recovered in low quantity from 14BU9. All features are postmolds and, therefore, it is not surprising that few seeds were found in feature samples. Most seeds and nuts came from a charcoal concentration (482N497W and 483N497W, 20-30 cm. B.S.), an artifact concentration (481N499W, 30-40 cm. B.S.), and level 3 (30-40 cm. B.S.) general level samples (see Leaf, Chapter 4, this volume, for a complete description of these areas). A list of carbonized seeds and nuts recovered is given in Table 6.3; remains from level 2 general level samples are combined as are those from level 3.

The small amount of flora recovered brings up the question of whether or not remains are associated with the prehistoric occupation; this is examined in light of the hypotheses outlined above. As mentioned previously, no samples were collected from off site proveniences. Implications of all hypotheses involve comparison of on and off site samples. Therefore, it is impossible to assess the exact nature of past natural agencies which might be responsible for the deposition of carbonized flora. As stated by Spectore (1970:172), the best way to determine if seeds recovered within a site are part of the native flora, that selected by site inhabitants, or a mixture of the two, is to test out of the site.

Although weaknesses in the sampling design exist, there are other implications of the hypotheses which can be used to infer whether plants recovered were utilized. Seeds and nuts used for food should be associated with cooking facilities. This presents another problem with the 14BU9 samples; features

Table 6.3. Carbonized flora from 14BU9.

Taxon	F360	F378	F381	F382	F385	F397	F405	Charcoal Conc.	Artifact Conc.	Level 2	Level 3	Total
Chenopodium spp. (goosefoot)	-	-	-	-	-	-	-	4	3	6	-	13
Celtis occidentalis (hackberry)	-	-	-	-	-	-	-	1	-	4	-	5
Galium aparine (cleavers, bedstraw)	-	-	-	-	-	-	-	-	5	1	-	6
Gramineae (grass family)	-	-	-	-	-	-	-	3	-	25	-	28
Scirpus spp. (bullrush)	-	-	-	-	-	-	-	-	-	1	-	1
Setaria spp. (bristle grass, foxtail)	-	-	-	-	-	-	-	-	-	3	-	3
Vitis riparia (river bank grape)	-	-	-	-	-	-	-	-	-	1	-	1
unidentified seeds	-	-	-	-	1	1	-	1	2	24	2	31
Juglans nigra (black walnut)	-	-	-	-	-	-	-	-	1.0 gm.	1.7 gm.	1.0 gm.	3.7 gm.
unidentified nutshells	-	-	-	-	-	-	-	< .1 gm.	.9 gm.	.9 gm.	.3 gm.	2.1 gm.
Total, seeds only	0	0	0	0	1	1	0	9	10	65	2	88

of this kind were not present within the excavation space. The charcoal concentration is probably just a random area of high density and no specific behavioral significance can be assigned to it; the case appears to be the same for the artifact concentration (see Leaf, Chapter 4, this volume). It is clear that the nature of the samples does not allow adequate testing of the first hypothesis.

The second hypothesis; seeds and nuts are associated with the occupation, but not necessarily utilized, has several implications which are operable, given the poor sample. One is that remains will be present in low frequency. Even though soil sample volumes are large, only 88 seeds and 5.8 gm. of nutshell are present. The most of any taxon recovered is for Gramineae, 28, but several unidentifiable species are present. The next most numerous taxon is Chenopodium spp. with 13.

Another implication is that all taxa must have grown in the area surrounding the site. For those identifications to only a genus level, the project environmental statement (U.S. Corps of Engineers 1972) and the Atlas of the Flora of the Great Plains (Great Plains Flora Association 1977) were consulted for species occurring in the project area. All plants recovered (Table 6.3) have preferred habitats which would have been within 50 m. of the excavation space, i.e., waste or disturbed ground, alluvial woods, or wet ground along streams (Steyermark 1963; Fernald 1950; Stephans 1969).

The last implication applicable to the Snyder site sample is carbonized flora should covary in density with other cultural material. In general, density of cultural debris increases toward the southwest corner of the excavation and with increasing depth (i.e., from level 2 to 3) (Leaf, Chapter 4, this volume). The distribution of seeds and nutshells is illustrated in Figure 6.2, (some sample proveniences were lost or mixed during a wind storm when samples were drying, therefore, these are not included in the diagram). Numbers above the slash indicate number of seeds per standard sample volume (17.5 l.); numbers below are grams of nutshell per standard sample volume. There is no apparent pattern in the occurrence of seeds; nutshells increase in density in the southwest corner where 1.0 of 2.6 grams recovered occur in the southwestern most three squares of level 2. Distribution of carbonized floral remains in level 3 is similar, i.e., seed density is low, but 3.2 of 5.8 gm. of nutshell from the entire excavation came from the four level 3 squares.

Thus, this hypothesis can be rejected as far as seeds are concerned. Although seeds occur in low quantity, there is no apparent covariation with cultural debris. However, nutshells do occur in low quantity and occur in greater density with increasing artifact density. Therefore, nutshells appear to be associated with the occupation, but seeds do not.

The implications of hypothesis 3, seeds and nuts represent natural carbonization due to past processes, can be only partially tested because of absence of off site tests. However, one implication, lack of patterned distribution, is true for seeds, but not nuts; this was discussed above.

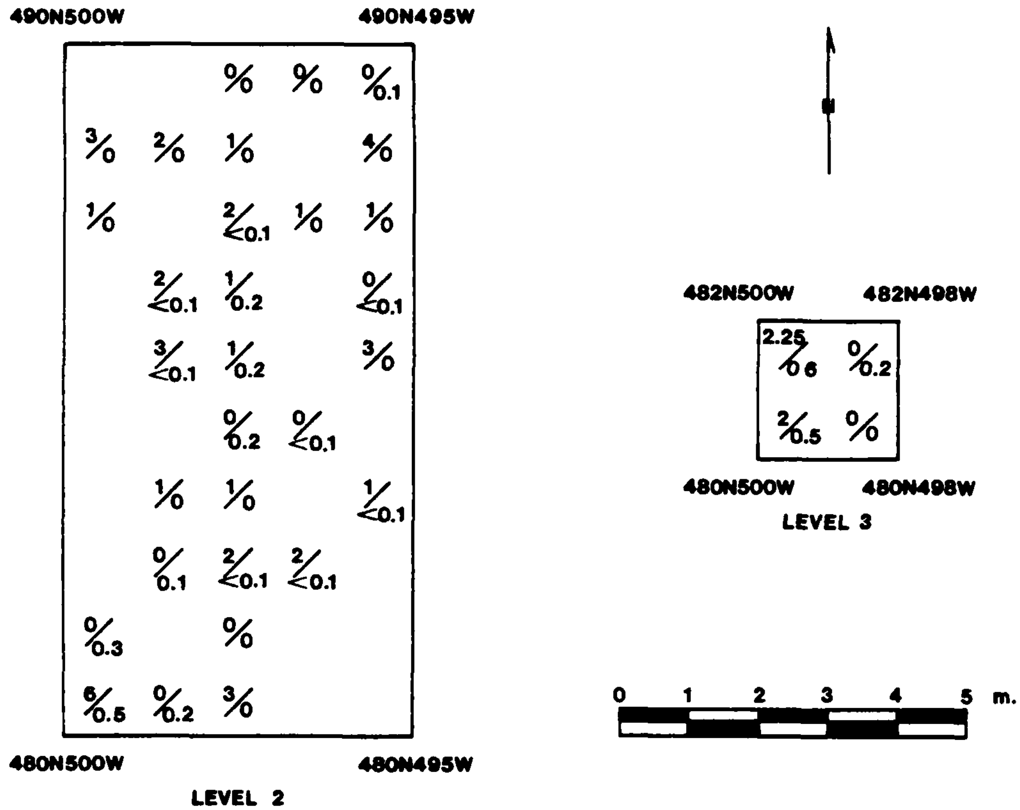

Figure 6.2. Distribution of seeds and nuts recovered from 14BU9. Numbers above the slash indicate number of seeds per 17.5 l. sample; numbers below the slash indicate grams of nutshell per 17.5 l. sample.

The last hypothesis, remains represent modern contamination, has the same implications as hypothesis 3 with the additional implication of the presence of uncharred seeds and/or carbonized modern domesticates of nonnative species. Uncharred seeds were found in all samples; a list of recovered taxa is in Table 6.4. (Uncharred Celtis occidentalis are whole berries, not just the calcareous shell.) Three carbonized specimens of Setaria spp. were recovered. The size of the seeds (2.7 mm. long) indicates that these must be from plants introduced from Europe (Steyermark 1963), and therefore, must be contaminants. The radiocarbon assay, taken from charcoal from the concentration in squares 482N497W and 483N497W, also appears to have been contaminated with modern carbon (Leaf, Chapter 4, this volume). Thus, at least some modern contamination is undeniable. It is also interesting to note that, with the exception of Vitis riparis and Scirpus spp., taxa of carbonized seeds are also present as uncharred contaminants.

Due to inadequate sampling design and a field error in processing, it is impossible to completely test all proffered hypotheses. It is certain that at least some carbonized seeds are present due to modern contamination and it is possible that others are present due to past processes unrelated

Table 6.4. Fresh seeds recovered from 14BU9.

Scientific Name	Common Name
Amaranthus spp.	pigweed
Carex spp.	sedge
Celtis occidentalis	hackberry
Chenopodium spp.	goosefoot
Chenopodium hybridum	maple leaved goosefoot
Crotolaria spp.	rattlebox
Galium aparine	cleavers, bedstraw
Gramineae	grass family
Helianthus spp.	sunflower
Mollugo verticillata	carpetweed
Oxalis spp.	oxalis
Phytolacca americana	pokeweed
Polygonum spp.	knotweed, smartweed
Portulaca oleracea	purselane
Setaria spp.	bristlegrass, foxtail

to the Woodland occupation. Carbonized nutshells (*Juglans nigra*) appear to be associated with past human activity; whether or not any seeds are is an analytical question impossible to answer at present. The possibility of utilization for food cannot be tested at all, but seeds, nuts, or fruit of all recovered plants were utilized by Native American in the ethnographic present (Smith 1923, 1928, 1932, 1933; Yanovsky 1936; Steyermark 1963; Yarnell 1964; Gilmore 1977). Therefore, as far as statements concerning past subsistence systems are concerned only the following can be said; it is probable that black walnuts were consumed and, with the exception of *Setaria* spp., other plants listed in Table 6.3 may or may not have been subsistence items.

14BU31

Even though fewer samples were taken from 14BU31 than 14BU9, results were more satisfying. Three features were discovered, two in backhoe trenches and one in XU102 (Fig. 6.1). Feature 302 is a basin-shaped pit whose sides and bottom were lined with burned limestone. The pit is 70 cm. in diameter at its origin and 25 cm. deep. This feature has been hypothesized to have served as a roasting pit. Food items were placed in the pit, surrounded by hot rocks and sealed; the pit was later opened, roasted food removed, and the pit was then backfilled. Feature 304 is a basin-shaped pit completely filled with limestone, burned earth, and charcoal. Approximately the eastern 5 cm. of the pit was removed in the digging of backhoe trench 1. Dimensions of the intact portion are 60 cm. north-south, 55 cm. east-west, and 31 cm. deep. The feature top had been truncated by plowing. The pit is similar to feature 302, but there is no evidence it had been opened for food removal and backfilled with midden soil; it may have been backfilled with limestone. Feature 305 is a small (19 cm. east-west, 7 cm. thick) lens of consolidated ash in the profile of backhoe trench 3; it is a pile of hearth cleaning debris (Leaf 1979).

Compared with 14BU9, good quantities of seeds were recovered from 14BU31 samples, especially the two pits. Feature 302 contained 109 seeds, feature 304 had 249; small quantities of nutshell were in both. Floral remains recovered are listed by provenience and quantified in Table 6.5.

Three hypotheses have been previously proposed to account for plant remains being in feature 302 (Leaf 1979). These are (1) by being introduced as food items to be roasted, (2) by being brought in when hot rocks were transferred from the initial heat source, and (3) as part of the general midden used to backfill the feature. The first two mechanisms are also applicable to feature 304; the third is not because this cooking facility was not backfilled with midden deposit. These hypotheses are more specific forms of two of the multiple working hypotheses presented above, i.e., carbonized plants are present as a result of utilization, or alternatively, other behaviors not related to using plants. All are discussed below.

The absence of off site samples makes it impossible to examine all implications of the hypotheses. Even without comparison of noncultural samples, the relatively large number of seeds associated with the two cooking facilities presents the possibility of use as food. Quantity of seeds present in features 302 and 304 (109 and 249, respectively) is certainly significantly greater than that obtained in general midden samples (4 and 5 seeds). Although the exact origin of cleaning debris which constitutes feature 305 is not known, the absence of seeds is interesting. The debris originated at a locus of burning, but no seeds are present. The implication is that seed rain was not being carbonized, at least not uniformly across the site. These facts lend support to the hypothesis that floral remains represent food items, but two implications, those involving off site comparisons, remain uninvestigated.

Implications of the second hypothesis, remains are associated with the occupation, but not necessarily utilized, are difficult to rigorously apply. Although seed frequency is much greater than in samples from 14BU9, numbers are still in a nebulous range where quantity alone does not unequivocally

Table 6.5. Carbonized flora from 14BU31.

Taxon	F302	F304	F305	XU102, Level 2	XU102, Level 3	Total
Amaranthus spp. (pigweed)	1	9	-	-	-	10
Chenopodium hybridum (maple leaved goosefoot)	1	1	-	-	-	2
Chenopodium spp. (goosefoot)	100	239	-	1	2	342
Galium aparine (cleavers, bedstraw)	-	1	-	-	-	1
Gramineae (grass family)	-	6	-	2	-	8
Helianthus spp. (sunflower)	-	1	-	-	-	1
Polygonum spp. (knotweed, smartweed)	5	-	-	-	-	5
unidentified seeds	2	2	-	1	3	8
Carya spp.	<.1 gm.	.1 gm.	-	-	-	.1 gm.
Total, seeds only	109	249	0	4	5	367

indicate utilization. A single, large Chenopodium plant may produce up to 100,000 seeds and since it grows in and around areas of human occupation, seeds can easily be introduced into campfires (Asch and Asch 1977:6). Although seeds covary with other cultural material (many more are present in features 302 and 304), there is a marked difference between features of possible differing origins (between features 302 and 304, and feature 305 as discussed above). Thus, the last implication is found to be false (that differences do not exist between samples of varying functional origin), therefore, this hypothesis is rejected.

The last hypothesis, remains are modern contaminants, cannot be rejected in toto. Uncharred seeds are present in all samples; a list is given in Table 6.6. However, the low number of charred seeds in midden samples indicates that if contamination with carbonized seeds is present, skewing effects are slight for feature samples.

The hypotheses presented by Leaf (1979) can be examined in light of the above discussion. There is a marked difference between the density of plant remains between feature 302 and the surrounding midden. Therefore, most seeds could not have been introduced during backfilling with midden deposits. As demonstrated above, carbonization of natural seed rain in man-made fires

Table 6.6. Fresh seeds recovered from 14BU31.

Scientific Name	Common Name
Amaranthus spp.	pigweed
Ambrosia spp.	ragweed
Chenopodium spp.	goosefoot
Euphorbia spp.	spurge
Gramineae	grass family
Mollugo verticillata	carpetweed
Panicum spp.	switch grass, witch grass
Phytolacca americana	pokeweed
Rubus spp.	dewberry, raspberry, blackberry
Setaria spp.	bristlegrass, foxtail
Symphoricarpos orbiculatus	coral berry

or by natural processes cannot account for observed seed distribution. Therefore, if seeds were introduced into features 302 and 304 during hot rock transfer, the locus of heating must also have been a plant food processing and/or consumption area. The hypothesis that seeds were introduced as food items to be roasted offers the most parsimonious explanation for their presence; i.e., the mechanism for introduction is simpler than for hot rock transfer. Therefore, although neither can be rejected on strictly logical grounds, support for the in situ food roasting hypothesis is strongest.

All taxa of recovered seeds and nuts have been documented ethnographically as food sources (Smith 1923, 1928, 1932, 1933; Yanovsky 1936; Steyermark 1963; Yarnell 1964; Gilmore 1977). A limestone nutting stone was collected from the site surface. In conjunction with the fact that hickory nutshells were recovered from the roasting pit, a reasonable inference is that the nuts were cracked, roasted, and eaten at the site. In summary, Chenopodium spp. seeds, and probably the other species as well, were roasted along with hickory nuts.

Summary

Evidence supporting a hypothesis of seed and nut use at 14BU9 is scanty. Black walnuts are associated with the occupation, but seeds do not appear to be so. The sample is small, sampling design inadequate, and no cooking or food storage facilities were discovered. These factors make adequate testing and explanation of results difficult. Woodland people at 14BU9 might have been using nuts and/or seeds minimally or not at all, relying on other plant foods; the occupation may have been at a time when seeds and nuts were not available or when stores had been exhausted (e.g., spring or early summer); or low frequencies may be due to poor, highly biased samples. Grinding stones have been recovered from the site, so some plant food processing probably occurred. Ambiguities cannot be resolved at present. However, it is recommended that off site sampling be included in future sampling designs. The hypothesis of nut and seed use at 14BU31 is not rejected; not surprisingly, indicating exploitation of the fall nut masts in the gallery forest and of the abundant seed crops produced by weedy plants.

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CHAPTER 7

A BEHAVIORAL CHAIN ANALYSIS OF THE CERAMIC ASSEMBLAGE FROM 14BU9

Matthew J. Root

Abstract

A behavior chain is the sequence of events that a set of objects were a part of during their "life" in the systemic context of a culture. This includes those activities from raw material procurement to artifact deposition in the archaeological record. It is within this framework that an empirical model of pottery vessel manufacture and use is generated. A considerable degree of variation in these processes is shown by the model. Several hypotheses are proposed which may account for observed variation; namely, (1) several ceramic bearing components are represented, (2) different manufacturing traditions are represented, (3) manufacture in different social contexts is represented, (4) different uses are represented, and (5) some sherds are from vessels of nonlocal manufacture. The small number of sherds recovered from intact cultural deposit precludes testing these hypotheses. Given the small sample, all alternatives are plausible.

Introduction

This study attempts to derive a behavior chain for manufacture and use of pottery vessels recovered from the Snyder site, 14BU9, located along the west bank of the Walnut River (Leaf, Chapter 4, this volume). Leaf (Chapter 4, this volume) summarizes previous work at the site and explains the nature of 1978 field investigations. The present analysis deals with the Woodland occupation(s). Early work revealed a relatively permanent occupation as inferred from 22 pits. All ceramics recovered during previous investigations came from plowzone or site surface proveniences (Grosser 1970, 1973). The sample for the present study consists of 186 pottery vessel fragments from 1968-1971 excavations and surface collections, and 25 sherds from 1978 excavations. Some specimens from earlier collections are at the Butler County Historical Society and are not included in this analysis. In addition, only sherds with two original surfaces are used herein; thus, the total number of specimens used from previous collections is smaller than originally reported (Grosser 1970:92).

Behavior Chains

A behavior chain is a model of the sequence of events that a given class of objects was a part of during its inclusion in an ongoing cultural system. This includes raw material procurement, artifact manufacture or preparation for utilization, use or uses, recycling activities, and discard. Analyses of such sequences of events have been accomplished in the past (Thompson

1958; Osgood 1940, 1942), although Schiffer coined the phrase "behavioral chain" (Schiffer 1975). Thompson (1958:3) states that it is almost impossible to adequately describe material culture without referring to the behavior which produced it. Osgood's (1951:211-12) concept of techniculture combined the behavior resulting in manufacture of material objects with the use of those objects and the material object itself. It is the entire "life" of material culture which is potentially relevant to the study of human behavior, not just the finished form.

That set of behaviors which combine sequentially to make up the behavior chain may be segmented into individual activities for analytical purposes. An activity is the interaction between an energy source, which is ultimately reducible to human terms, and at least one cultural element. As defined by Schiffer (1975:109; 1976:49-53), activities are described by seven components. These are (1) a description of the activity in behavioral terms, (2) the nature of the energy source(s) which partially comprise the activity, (3) all other cultural elements associated with the activity, (4) time and frequency of activity performance, (5) locus of activity performance, (6) points at which other behavior chains intersect or diverge from the one under study, and (7) how the material remains that represent the activity are deposited in the archeological record.

Behavior chains deal with repetitive and patterned human behavior. This means that activities under consideration should be reflected in the archeological record by repeated occurrences of materials which represent those activities. This has been stated as the criterion of repetition (Krause and Thorne 1971:247). Activities must be demonstrably sequenced to be considered significant. Those instances of repetitive behaviors must occur in a set of antecedent and/or consequent behaviors to be relevant in this kind of investigation. This has been called the criterion of linearity (Krause and Thorne 1971:247). A third criterion was also set forth, that of invariance (Krause and Thorne 1971:249-50). This stated that variation within a properly defined class of behavior will approximate a normal probability curve, due to the fact that behavior is rule governed and variation is a result of randomly deflected behavior around a commonly held idea of the desired end product. It is not felt that this is a necessary criterion for patterned and repetitive human behavior. Although this is undoubtedly true in some cases, other factors influence distributions of measures reflecting behavior (e.g., raw material constraints) that are not thoroughly understood in all cases. In addition, people do not always behave according to a static set of cultural rules (Binford 1978). These factors might very well cause different distributions.

Discerning activity patterns in space is an integral part of behavior chain analysis. Material remains in an archeological site may be, but not necessarily, patterned or structured in a way that directly reflects behavior patterning. At any rate, this is not an assumption, but a problem for analytical demonstration (Krause and Thorne 1971:246). Spatial patterning in the archeological record is partially a result of partitioning activity space. However, the nature of the data employed in this investigation precludes definition of any components in the behavior chain which are dependent on location and spatial patterning. This is due to the fact that

the collection is predominantly from a surface grab sample and plowzone excavation units. Therefore, times, frequencies, and locations of activity performance, and modes of discard are indeterminate.

Data recorded in the present analysis are designed to be the basis for inferences concerning raw material procurement, manufacture, and use of pottery vessels. These data are attributes indicative of certain procedural modes. As originally defined by Rouse (1939:11-12), modes are single attributes used for analytical purposes. Examples are single designs or techniques of manufacture. Modes are conceptual patterns devised by the investigator to represent ideas possibly held by the manufacturer of the object under study. These ideas are seen as standards of behavior or cultural patterns to which the artisans conformed. In other words, modes are concepts which are reflected in artifact attributes.

Modes were later divided into two classes, procedural and conceptual. Conceptual modes are "concepts of material, shape, and decoration to which the artisan conformed." Procedural modes are the "customary procedures followed in making and using the artifacts" (Rouse 1960:315). Procedural modes are identifiable through an attribute or set of attributes present on the artifact itself. From those attributes, behavior is inferred. However, conceptual modes are supposed to represent past concepts as designated by observable attributes. In the case of procedural modes, inferred behavior is testable by experiment. On the other hand, inferred concepts are not. They appear to be the conceptual modes of the archeologist, which may or may not correspond to the thoughts or intents of the artisan. At any rate, inferred concepts are not amenable to test, and as such are not used in the present analysis.

A procedural mode is a class whose denotata (Members) are the empirically observable results of single instances of patterned and repetitive human behavior. Co-occurring procedural modes of the same class combine to form element sets. Procedural modes are defined by intentional definitions, i.e., the necessary and sufficient conditions for membership in that class (Dunnell 1971:16-17). The necessary and sufficient conditions for class (mode) membership consist of the empirically observable evidence by which a mode may be identified. In addition, the kind of tool and its shape pertinent to the procedural mode, biomechanical processes of tool application, and position relative to the pottery vessel manufacturing sequence are given. This type of definition is amenable to behavior chain analysis. These definitions are also operational, i.e., there are testable criteria given in terms of experimental procedure (Hempel 1952:41). The reliability of the definitions may at least be judged by replicative experiments.

In recording procedural modes, the ceramic environment (location on the pottery vessel) is noted. These are defined by nominal definition. The following definitions are not applicable to all possible pottery vessel shapes. Examples of these are hyperboloid forms or forms with continuously expanding or constricting surfaces. However, the definitions are consistent with forms usually found in the Plains. If a system can be devised where all forms are accounted for, wide application of those definitions would obviously be enhanced. The present set of definitions contains two primitive terms, meanings of which follow.

Pottery: the term "pottery" shall be understood to mean any manufactured object of prepared and fired clay.

Surface: the term "surface" shall be understood to mean any two dimensional locus of points.

Other terms not defined herein, but used in the nominal definitions are taken from geometry and have the same meaning as previously defined in that discipline.

The defined terms, or extra-logical vocabulary, follow:

Vessel $=_{Df}$ pottery with two surfaces such that the area of one is proportionately greater than the area of the other.

Exterior $=_{Df}$ the surface of a pottery vessel which is proportionately the smallest.

Lip $=_{Df}$ that portion of a pottery vessel that extends from the junction of the interior and exterior pottery vessel surfaces to the plane that is closest to that junction and is perpendicular to the interior and exterior surfaces, i.e., where the interior and exterior pottery vessel surfaces become parallel.

Body $=_{Df}$ that part of a pottery vessel that does not include the lip.

Shoulder $=_{Df}$ that part of a pottery vessel body of maximal circumference.

Base $=_{Df}$ that part of a pottery vessel body of minimal circumference.

Upper $=_{Df}$ that part of a pottery vessel body joining the lip with the shoulder.

Lower $=_{Df}$ that part of a pottery vessel body joining the shoulder with the base.

Neck $=_{Df}$ that part of the upper body of a pottery vessel of minimal circumference.

Rim $=_{Df}$ that part of the upper body of a pottery vessel which is between the lip and the neck.

Ceramic Data Code

Attributes recorded are those that reveal information concerning the sequential behavior of pottery vessel construction and use. Variables that represent the nature and perhaps source of raw materials, clay preparation, techniques of forming and shaping the vessel, finishing the surface, firing, use, and provenience are recorded. The meaning and purpose of the variables are briefly outlined below. Most observations were made with the aid of a binocular microscope.

The kinds of natural inclusions in the paste are observed to gain knowledge concerning nature and location of clay sources. It is realized

that only a rough first approximation may be gained with this type of data. However, the fact that different clay sources were utilized or the possibility that nonlocal clay was used may be the types of useful preliminary information obtained. These data may be used to more advantageously select sherds for petrographic analysis, results of which would provide more reliable information concerning raw material utilization.

Aplastic natural inclusions are distinguished from temper by the kind, size, and relative abundance of those materials in the paste. Various aplastics do not occur naturally in clay, e.g., sherd, bone, certain types of rocks, and coarse sand. Other materials occur in clay only in characteristic forms. For example, quartz occurs in some clays as fine water-sorted silt, but does not occur naturally as coarse water-worn sand. Mica and calcite occur naturally in some clays and therefore, could be either temper or natural inclusions (Shepard 1956:159-60).

The natural inclusions observed in the pottery sample from 14BU9 are mica, quartz, iron oxides, and a soft white mineral. Mica is identified by its form as small, flat, shining flakes. Micas have one perfect cleavage plane, which is the reason for their morphology. Small fragments of mica occur naturally in sandstones and shales of Kansas (Tolsted and Swineford 1957:47-8). The term quartz refers to very small, (usually visible only with magnification) rounded white or clear crystals. This type of quartz grain occurs as fine silt in some clays (Shepard 1956:161). Iron oxides are red, yellow brown, dark brown, and black particles. Size varies from microscopic to easily visible with the unaided eye. The most common of these is hematite, although limonite was also observed. These occur in many clays and shales of Kansas (Tolsted and Swineford 1957:46).

Temper is any aplastic agent which could not occur naturally in clay or could not occur in the abundance and size range observed under natural conditions. Therefore, it is assumed to have been added by the potter. Kinds of temper recorded are limestone, sand, indurated clay, grog (sherd), calcite, and combinations of the above. Limestone is considered to be any noncrystalline form of calcium carbonate. All identifications are tested with dilute hydrochloric acid. If a material is calcium carbonate, reaction with HCl will produce bubbles of carbon dioxide. Sands are unconsolidated grains of quartz with a relatively large range in size. Some grains are around four mm. in diameter. Indurated clays are clays that have been hardened by natural agencies. These are characteristically gray or yellow, but are not always hard when present in sherds. This is assumed to be due to leaching agents in the ground. Soft, white or yellow material that gave no reaction with HCl, i.e., did not effervesce, was called indurated clay. Grog temper was identified by one necessary and sufficient criterion for inclusion in that temper class. Particles of clay in a sherd that themselves contained observable tempering agents were classified as grog. Two conditions that were sufficient, but not necessary were the apparent presence of old sherd surfaces and a wide range of color in the aplastic material indicative of differential oxidation in sherds. The final observed temper is calcite; a crystalline form of calcium carbonate that occurs in limestones. It is white or clear and reacts readily with cold, dilute hydrochloric acid. This mineral does occur naturally in clays (Shepard 1956:162;

Tolsted and Swineford 1957:42), but not in the quantities observed in the pottery sample.

Temper particle size range and quantity were recorded. Quantity estimates were in terms of percentage of limestone by weight in experimentally produced ceramic briquettes. Temper particles were size graded with geologic screens. This is similar to the procedure outlined by Matson (1969:595). However, it is not felt that most of these observations are very accurate. This is due to the fact that tempers other than limestone were present in the collection and there is a large degree of variability in temper particle size.

Definitions of procedural modes that relate to forming and shaping the pottery vessel and finishing the surface follow.

Smoothing, Nonpliable

A hard tool, e.g., a pebble, piece of bone or wood, was slid over the surface of a pottery vessel while the clay was in a plastic state. This mode is evidenced by (1) broad, shallow U-shaped grooves with numerous small striations inside the trough and parallel to it, (2) unmodified U-shaped grooves are of uniform depth and width, (3) aplastic particles which are visible on the surface have been pushed into the clay, level with the pottery vessel surface, (4) aplastic particles which are on the surface tend to have flat surfaces alligned with the pottery vessel's surficial plane, and (5) aplastic particles visible on the surface have clay sloughed over their edges due to plastic flow of the clay (Fig. 7.1a).

Smoothing, Pliable

A soft tool, e.g., a hand or piece of leather, was slid over the surface of a pottery vessel while the clay was in a plastic state. This is evidenced by (1) very small, parallel, U-shaped striations on the pottery vessel surface, (2) the striations are of uniform depth and width, (3) relative to the procedural mode of smoothing, nonpliable, large numbers of aplastic particles are visible on the pottery vessel surface, (4) aplastic particles are not pushed into the pottery vessel surface, but project out from it, (5) aplastic particles do not regularly show flat surfaces, but may exhibit any shape, (6) aplastic particles have clay pushed or sloughed up around their projecting sides, but few have any clay pushed over their outermost projecting surfaces (Fig. 7.1b).

Cord-Wrapped Paddle Impressed

A paddle that had a twisted cord wrapped around it was struck or pressed against the pottery vessel surface while the clay was in a plastic state. The cord was placed around the paddle so that successive loops were parallel, or nearly so, with each other. This is evidenced by (1) linear depressions, approximately as deep as they are wide, (2) the depressions

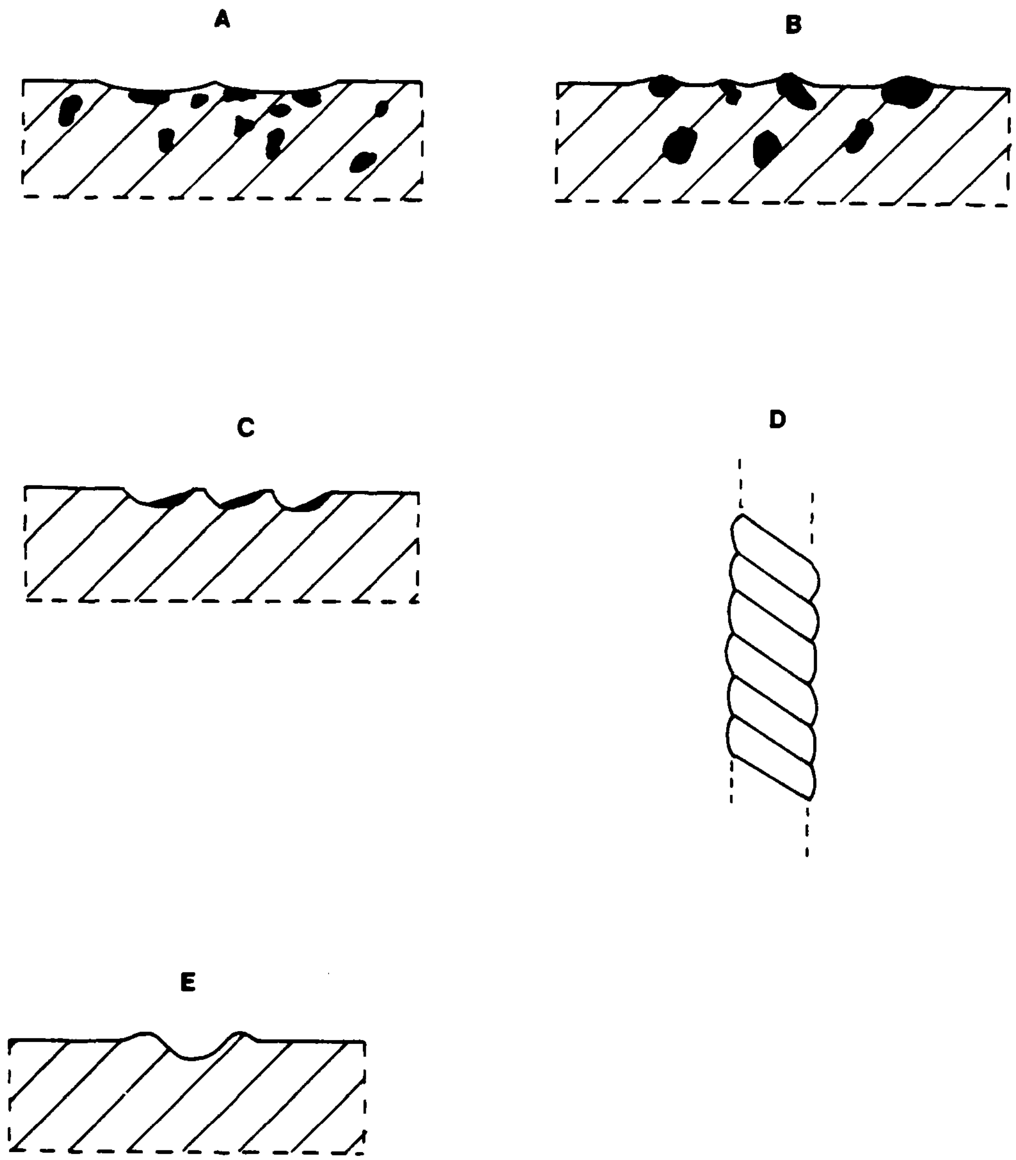

Figure 7.1. Diagrammatic illustrations of surface procedural modes represented in the pottery sample from 14BU9: (a) nonpliable smoothing, cross section; (b) pliable smoothing, cross section; (c) cord-wrapped paddle impression, cross section; (d) cord-wrapped paddle impression, plan view; (e) trailed line, U-shaped, cross section. (exaggerated scale).

have undulating bottoms and sides occurring at regular intervals to form helix impressions (Fig. 7.1c,d).

Trailed Line, U-Shaped

An elongate, nonpliable tool with a rounded or U-shaped end, such as a piece of wood, bone, or antler was pulled along the surface of a pottery vessel with the end of the tool in the clay. This was accomplished while the clay was in a plastic state. Evidences for this mode are (1) a deep, wide, U-shaped trough easily visible to the naked eye, (2) striations are visible microscopically which run parallel to the sides of the trough, (3) any aplastic particles in the trough which are visible on the surface are pushed into the clay, (4) clay is sloughed up, forming a slight ridge along the edge of the trough. This is indicative of plastic flow, (5) the trough formed by this process is in excess of 1 cm. in length (Fig. 7.1e).

Tool Impressions; Round, Oblique Angle

A tool which had a cylindrical shape and a rounded end at the effective portion, was pressed into the clay at an oblique angle to the pottery vessel surface; the tool was then withdrawn. Examples of the kind of tool used might be a piece of wood, bone, or antler. The tool was applied when the clay was in a plastic state. Observable results of this behavior are (1) an impression with an ellipsoidal shape in plan view, (2) along the major axis of the ellipse, one end of the impression has a steep-sided wall from the vessel surface to the bottom of the hole, (3) moving from this point along the major axis, the bottom of the impression slopes up evenly to intersect the pottery vessel surface, (4) the profile of the impression along the minor axis of the ellipse is regular and U-shaped, (5) the clay is impressed, not displaced, therefore, no clay is sloughed around the margins of the impression (Fig. 7.2a,b,c).

Dentate Stamping

A tool with a rounded or straight edge, such as a shaped piece of wood or bone, was notched so as to resemble part or all of a geared wheel or toothed linear implement. The notched edge of the tool was pressed into the pottery vessel's surface. The tool was pressed far enough into the surface that the cogs were completely embedded in the clay. If the tool had a rounded edge, it was rolled in a straight line over the pottery vessel surface. If the tool was linear, it could be rolled over the surface or pressed straight into it. This is evidenced by (1) a line of square to rectangular impressions, (2) areas between impressions are low ridges running perpendicular to the line of impressions themselves, (3) these ridges are lower than the rest of the pottery vessel surface, (4) the bottoms of the impressions are flat and lie in a plane parallel to that plane which is tangential to the vessel surface at that point (Fig. 7.2d,e).

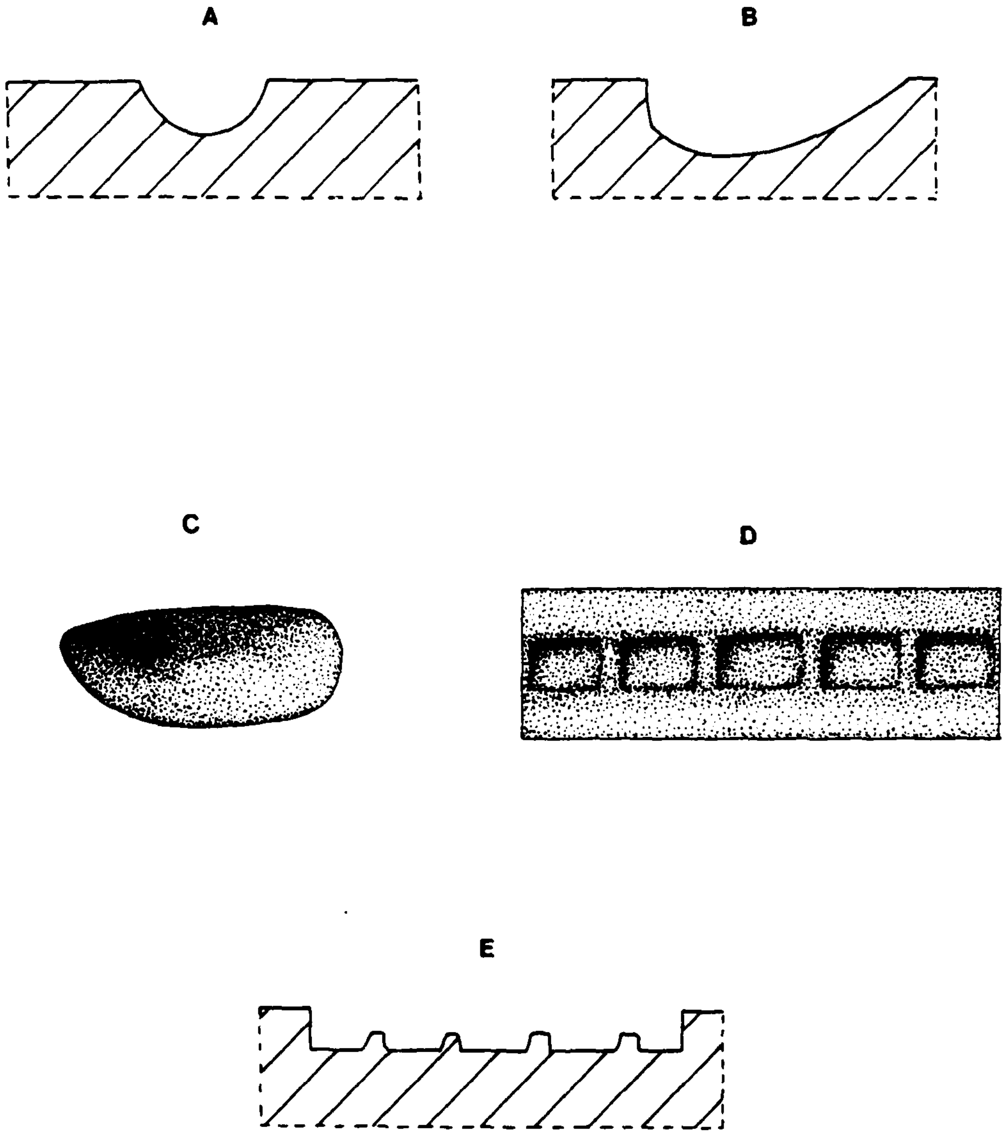

Figure 7.2. Diagrammatic illustrations of surface procedural modes represented in the pottery sample from 14BU9: (a) tool impression, round, oblique angle, cross section along the minor axis; (b) tool impression, round, oblique angle, cross section along the major axis; (c) tool impression, round, oblique angle, plan view; (d) dentate stamping, plan view; (e) dentate stamping, cross section. (exaggerated scale).

Punch Emboss, Oblique Angle

A cylindrical tool with a rounded end was pushed into the pottery vessel surface. The tool was then withdrawn. These actions were accomplished when the clay was in a plastic state. Examples of tools possibly used are a piece of wood, bone, or antler. The tool was held at an oblique angle to the pottery vessel surface and inserted far enough into the clay to cause plastic flow in the opposite surface. This results in (1) a low, well-rounded mound of clay directly opposite the tool impression, (2) the tool impression itself is a well-rounded, deep pit, (3) the periphery of the impression slopes gradually inward, (4) in plan view, the impression is ellipsoidal, (5) in cross section, along the major axis of the ellipse, one end is deep and gradually slopes toward the vessel surface, (6) the cross section along the minor axis reveals a hemi-ellipsoidal profile (Fig. 7.3 a,b).

Tool Impressions, Cylindrical

A cylindrical tool, such as a piece of bone or wood, was pressed into the pottery vessel's surface. The implement was held parallel to the plane which is tangential to the point or points of contact on the pottery vessel surface. The tool was applied in such a manner that the ends of it were not in contact with the pottery vessel surface. This was done while the clay was in a plastic state. This procedure results in (1) impressions in the pottery vessel surface which are round-bottomed in cross sectional view, (2) in the same perspective, slight, low, rounded mounds of clay are present at the periphery of the impression. This results from plastic flow of clay as it is displaced in the process of tool application, (3) if the tool was applied so that the impression was terminated by a pottery vessel edge, the impression is square or rectangular in plan view. Clay is sloughed past the unaltered edge, again a result of plastic flow, (4) if the tool impression was not terminated by a vessel edge, its ends feather out toward the pottery vessel surface (Fig. 7.3c,d,e).

Construction of the pottery vessel lip is also a procedural mode. Those lips that were judged to have been manufactured with different procedures were defined as separate procedural modes; definitions follow. Lip manufacturing modes are numbered for reference.

Lip Mode 12

A pliable, regularly surfaced tool such as a piece of leather or a hand was slid along the upper interior and exterior rim surfaces to form the vessel's lip. This was done while the rim was in a plastic state. The pliable tool was placed over the upper rim so that it was in contact with the interior and exterior surfaces simultaneously. Even pressure was applied to both surfaces of the upper rim and the tool was placed a small, but equal distance from the junction of the two surfaces towards the rim. This resulted in (1) interior and exterior lip surfaces that intersect each other at a well rounded angle of almost 180°, (2) the interior and exterior lip surfaces

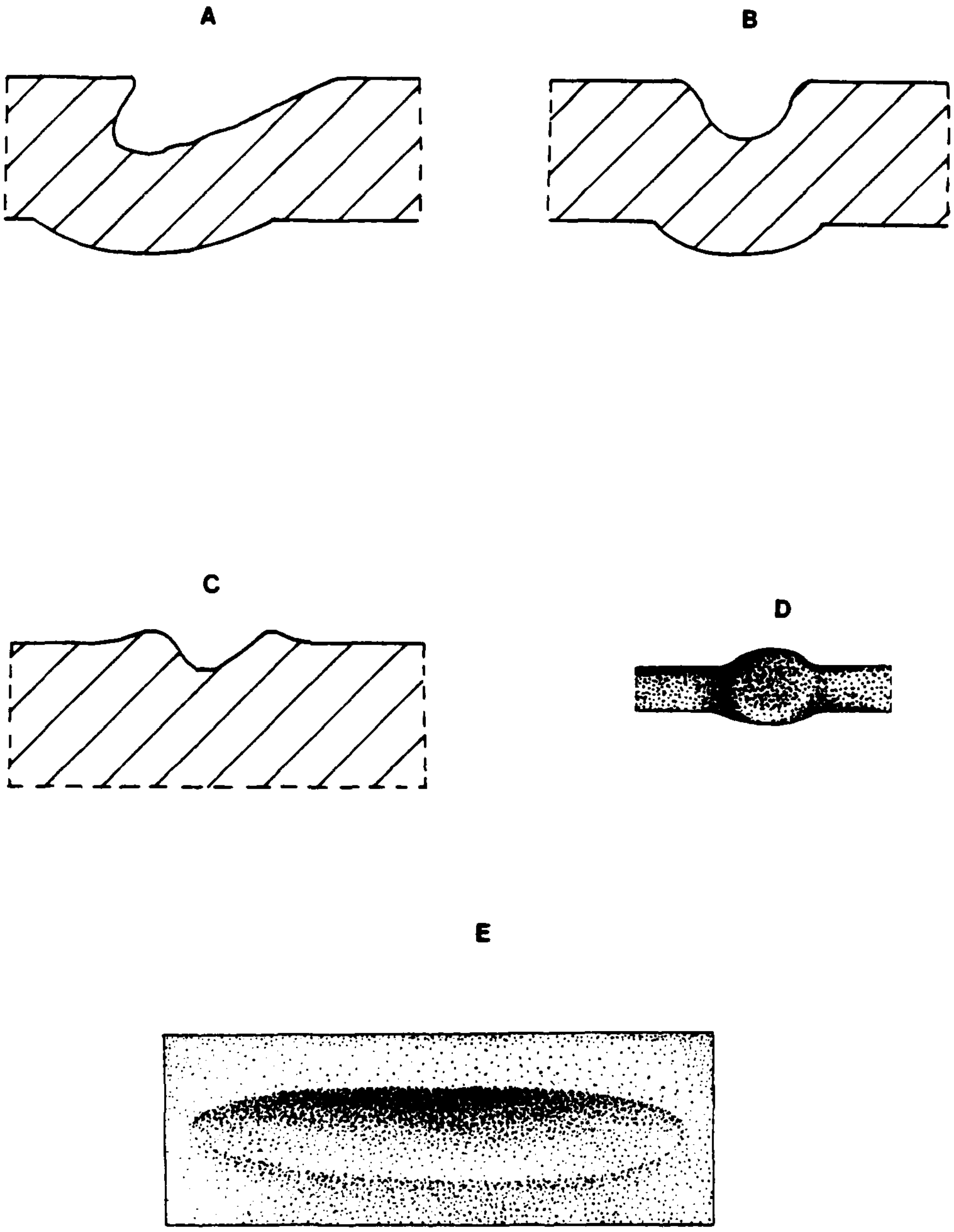

Figure 7.3. Diagrammatic illustrations of surface procedural modes represented in the pottery sample from 14BU9: (a) punch emboss, cross section along the major axis; (b) punch emboss, cross section along the minor axis; (c) tool impression, cylindrical, cross section; (d) tool impression, cylindrical, edge termination, plan view; (e) tool impression, cylindrical, feather termination, plan view. (exaggerated scale)

intersect the interior and exterior rim surfaces, respectively, at well rounded, obtuse angles, (3) these angles are equal in magnitude, (4) the lip surfaces are generally smooth with slight undulations (Fig. 7.4a).

Lip Mode 14

A pliable, regularly surfaced tool such as a piece of leather of a hand was slid along the upper interior and exterior rim surfaces to form the vessel's lip. This was done while the rim was in a plastic state. The pliable tool was placed over the rim so that it was in contact with the uppermost, interior and exterior surfaces of the rim simultaneously. The tool was placed over the uppermost rim surface at an angle which sloped downward toward the vessel's exterior surface. On the interior and exterior lip surface, the tool was originally oriented along the existing plane of those surfaces. Pressure was applied to the uppermost portion of the lip surface with the tool. Equal pressure was applied to both the interior and exterior lip surfaces, but this was less than that applied to the uppermost portion. This resulted in (1) the plastic paste being pushed outward and downward forming slight bulges on the lip's interior and exterior surfaces, (2) the lip's uppermost edge is generally flat, but has very slight undulations and slopes downward toward the pottery vessel's exterior surface, (3) the lip's uppermost edge intersects the interior lip surface at a smoothly rounded, but distinct acute angle, (4) the lip's uppermost edge intersects the exterior surface of the lip at a smoothly rounded, but approximate right angle, (5) both interior and exterior lip surfaces intersect the interior and exterior rim surfaces, respectively, to form smooth concave surfaces. Thus the lip is thicker than the upper rim (Fig. 7.4b).

Lip Mode 15

A pliable, regularly surfaced tool such as a hand or a piece of leather was slid along the upper rim to form the lip. This was accomplished when the upper rim was in a plastic state. The pliable tool was placed over the lip so that it was in contact with the interior, exterior, and uppermost portions of the rim simultaneously. However, the tool was placed further down on the rim's interior surface than on the rim's exterior surface. The tool was placed on these surfaces at an oblique angle to the plane of the rim's lower surfaces. Equal pressure was applied to both interior and exterior surfaces. This resulted in (1) lip interior and exterior surfaces which intersect each other at a well rounded, but acute angle, (2) the lip's interior surface intersects the rim's interior surface at a well rounded, but obtuse angle, (3) the lip's upper exterior surface intersects the lip's lower exterior surface at a well rounded, but obtuse angle, (4) the lower lip's exterior surface joins the rim at a 180° angle, (5) this results in a lip that is thinner than the rim, (6) lip surfaces are generally smooth with slight undulations (Fig. 7.4c).

Lip Mode 16

A nonpliable, smooth surfaced tool such as a pebble, piece of wood, or

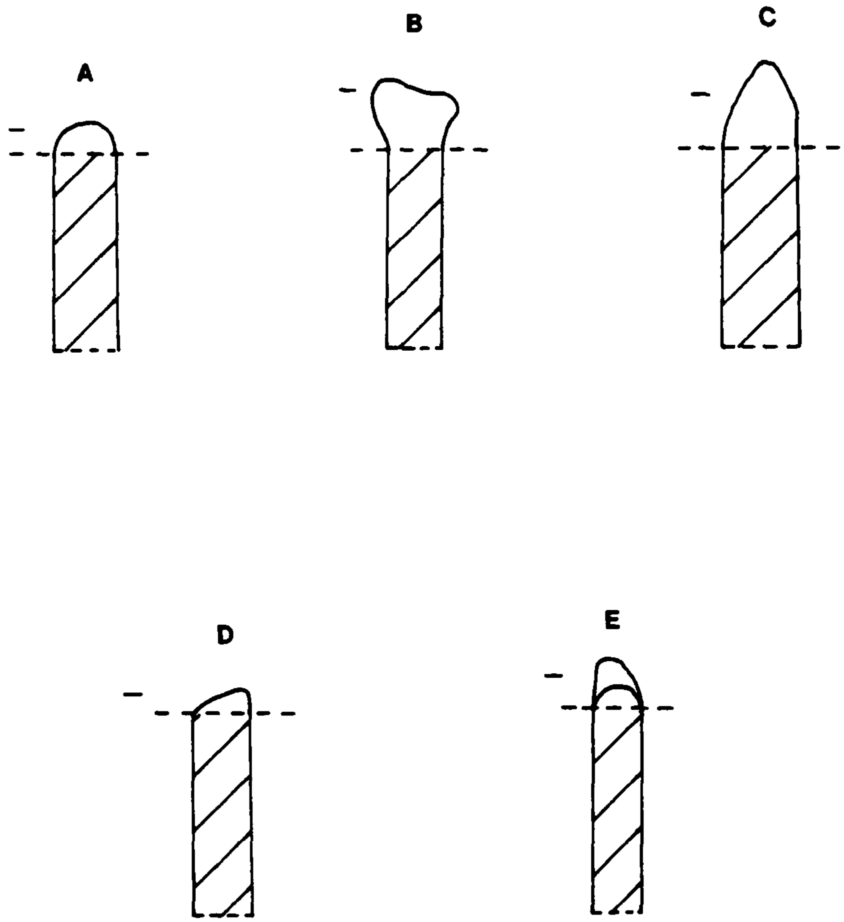

Figure 7.4. Observed lip forms that represent lip formation modes in the pottery sample from 14BU9: (a) lip mode 12; (b) lip mode 14; (c) lip mode 15; (d) lip mode 16; (e) lip mode 17; "-" denotes interior surface, (no scale).

piece of bone, was slid along the interior and exterior rim surfaces to form the vessel's lip. The lip was then smoothed with a pliable tool such as a hand or piece of leather. This was accomplished when the rim was in a plastic state. The order of finishing the interior and exterior surfaces cannot be determined. The exterior lip manufacture is described first. The nonpliable tool was placed on the uppermost exterior rim surface and was moved along the circumference of the vessel orifice. The tool was held even with the exterior rim surface. The lip exterior was formed in this manner. To form the lip interior, the tool was applied to the uppermost lip surface at an angle which sloped downward toward the vessel's interior surface. The tool was moved along the interior portion of the lip following the orifice circumference. The nonpliable tool smoothing covers only the inner one third of the lip interior. The interior lip was then lightly wiped with a pliable tool. This last finishing technique was not enough to obliterate the evidences of nonpliable tool smoothing. This results in (1) the interior lip surface intersecting the interior rim surface at a rounded, but distinctly obtuse angle, (2) the interior lip surface is flat and smooth toward the interior of the pottery vessel. The remaining portion of the lip is smooth, but has many pronounced undulations, (3) there is a slight ridge formed on the interior lip surface where nonpliable tool smoothing ceased, (4) the interior and exterior lip surfaces meet at a rounded, but distinctly acute angle, (5) there is a slight ridge at the juncture of the interior and exterior lip surfaces caused by plastic flow from the pliable tool smoothing of the interior surface of the lip, (6) the exterior lip surface intersects the exterior rim surface at a 180° angle (Fig. 7.4d).

Lip Mode 17

A small node of clay was added on to the rim. A pliable, regularly surfaced tool such as a hand or a piece of leather was slid along the uppermost rim surface to form the lip. This was [illegible] while the rim was in a plastic state. To form the node, part of a pliable tool was held even with the interior surface, while the remaining part was placed on the exterior surface of the upper rim, so as to form an obtuse angle with the lower exterior rim surface. With the tool thusly positioned, a node of clay was formed and added to the uppermost rim surface. This process appears to be an additive one because there is no clay displaced from the rim below the node to indicate that it had been pinched up. A pliable tool was then placed over the lip and upper rim, so as to be in contact with the interior and exterior pottery vessel surfaces simultaneously. Even pressure was applied to all surfaces as the tool was slid around the orifice circumference.

These behaviors resulted in (1) a lip with a gently, uniformly curved surface forming a semi-circular cross section, (2) the lip flows evenly into the rim surfaces, (3) the node projects vertically from the lip surfaces and is well rounded, (4) the node's lower interior surface is even with the rim's interior surface, (5) the exterior node surface is gently incurved, going from the exterior rim surface towards the lip, (6) in a horizontal cross sectional view, the node is hemi-ellipsoid (Fig. 7.4e).

Three rim shapes are defined; straight, excurved, and incurved. A rim is straight if the interior and exterior rim surfaces are of equal proportions and there are no inflection points present along those surfaces. A rim is excurved if the rim surface is proportionately greater than the exterior rim surface and there are no inflection points present along those surfaces. A rim is incurved if the exterior rim surface is proportionately greater than the interior rim surface and there are no inflection points along those surfaces. If an inflection point is present along a rim surface, the rim shape is complex, i.e., a combination of at least two of the above simple shapes.

Data recorded which are pertinent to firing processes are colors of the clay. Color was observed on a freshly broken surface for the interior, exterior, and core. Colors recorded and the approximate corresponding Munsell Soil Chart chips (1975 edition) are: black (7.5YR 2/0), dark gray (7.5YR 3/0), light gray (7.5YR 5/0), dark brown (10YR 4/2, 10YR 3/2), light brown (10YR 7/4), red (5YR 6/6, 5YR 5/6, 2.5YR 5/8), and white (7.5YR 8/0).

Although firing temperature and techniques are difficult to deduce from color, it does afford opportunities to find out if the clay was oxidized or not. Color ranges for the original, unfired clay can also be deduced from the color of the fired clay (Shepard 1956:213-14, Table 1). This might yield information concerning clay sources.

Various wear patterns were recorded from which categories of use may be inferred. These include carbon smudging, scratches, polish, grinding, crushing, and the presence of charred organic matter. Only charred organic matter and smudging were observed, perhaps due to the poor state of preservation of most sherds. Carbonaceous matter adhering to vessel surfaces may indicate that those vessels were used for cooking.

Vessel Manufacture and Use

The processes of manufacturing and using pottery vessels is by its very nature a sequenced set of activities. Before pottery vessels can be made, raw materials must be procured. Most clay available to prehistoric people of the Great Plains would have to be prepared before it would be suitable for use. This would minimally involve working the clay into a homogeneous mass. Foreign material may have been removed, temper added, or the clay may have been weathered. It must then be fired to produce a pottery vessel which is ready for use (Hodges 1964:19-41). It is within this broad framework of noncommutative activities that pottery vessel manufacture and use at 14BU9 is modeled. This is accomplished by a series of inferences based on empirical observations of attribute occurrence and co-occurrence.

Raw Material Procurement

Data recorded herein pertaining to raw material procurement are minimal. If certain clays have characteristic aplastic inclusions, then it may be possible to narrow the range of potential clay sources. The most common natural inclusions are quartz, iron oxides, and mica, which occur in various

combinations. Excepting those sherds with indeterminate inclusions, these occurred in all cases. Different combinations of these minerals are not felt to reflect useful variation because all are common in Kansas clays (Tolsted and Swineford 1957), and some variation is probably due to determinacy problems.

However, one other natural inclusion was observed. This is a soft mineral with indistinct cleavage that varies from white to light green. This occurs in some, but not all, indurated clay tempered sherds with dentate stamping; trailed lines; and/or round, oblique angle tool impressions, but in no cord-wrapped paddle impressed sherds. However, these inclusions were observed in two heavily eroded sherds with indeterminate surface elements. This may indicate that some pottery vessels with surface elements other than, or in addition to smoothing and cord-wrapped paddle impressions were manufactured with clay from a different source than that used for the rest of the collection. The sherds may represent different local clay sources, used selectively for different vessels by one group of people, or used by groups of people representing different occupations. The clay might also have originated from a nonlocal source and thus, the sherds might represent trade or movement of people. These differing explanations cannot be unequivocally resolved at present.

Possible colors of unfired clay can be inferred from the color of fired clay; relationships are listed in Table 7.1. Fifty-one combinations of interior surface, core, and exterior surface color are present. This is a large degree of variability, but is not surprising given the numerous systemic and postdepositional processes which affect color. Unfired clay of one color can turn many different colors when fired. This is evidenced by the fact that single sherds may exhibit a great degree of variability. Even so, it

Table 7.1. Relation between pottery and unfired clay color.[1]

Pottery Color	Unfired Clay Color
white	white, neutral gray, black
light brown	cream, yellow, neutral gray, black, gray brown (rare), brown (rare)
red and dark brown	yellow, red, brown, grays, black
dark gray and black	all colors

[1]from Shepard 1956, Table 1

may be possible to delimit different clay sources. This may be done if unambiguous color associations are present, i.e., observed pottery colors could only have resulted from one original clay color. Unfortunately, no such combinations are present. All pottery could have been manufactured from gray or black clays. Experimentation and petrographic analysis are techniques to further test the significance of color.

Preparing the Paste

Temper was added to clay before the vessel was formed in all represented cases. Although aplastics weaken the binding properties of clay, they counteract shrinkage and aid in even drying. This reduces the chance of vessels cracking while drying (Shepard 1956:25). Various tempers and in varying amounts were added to clays represented in the sample. Combinations of limestone and indurated clay, and sand and indurated clay are each unique occurrences and are also the only observed instances of co-occurring procedural modes of temper addition. Grog temper was added in three cases, all in about the same proportions. Sand was added in 29 instances, 23 of which have quartz grains ranging from less than 1 mm. to around 4 mm. in diameter. Grain size variability is present and grains are definitely larger than the small quartz grains classed as natural inclusions, therefore, these are judged to be temper particles. Indurated clay is present in 98 sherds; particle size ranges from less than 1 mm. to about 4 mm. in diameter. Calcite temper was added in uniform, relatively large amounts. Abundance compares favorably with the 40% to 50%, quantity by weight, experimental briquettes and is of relatively great size range (less than 1 to 4 mm.). Thirty-six sherds are calcite tempered, but others appear similar except that the temper is leached out, leaving only vacuities.

Forming and Shaping the Vessel

Evidence for two forming techniques is present; coil construction and paddling. In coil construction, rolls of clay are built up spirally or laid as a succession of rings (Shepard 1956:57-9). This technique is deduced from two coil juncture fractures (Fig. 7.5a), which may occur where poorly joined coils form a weak spot. If a pottery vessel breaks at a juncture, sometimes smooth surfaces of the original coils are apparent. Although only two coil juncture fractures are present, usually they are rare, because they occur only where coil welding has been faulty (Shepard 1956:183-84). Even the approximate frequency of the coil construction technique is impossible to estimate due to the vagaries of breakage. The lack of evidence for coil juncture breaks on all but two sherds is negative evidence that indicates lump modeling may have been employed to form pottery vessels. One basal sherd is present which has evidence of lump modeling. The interior is uneven, and appears to have been molded by the fingers. It is possible that bases were lump modeled with the rest of the pot being built up by coiling or that some pots were entirely lump modeled.

The possible use of a paddle and anvil to shape pottery vessel walls is inferred from the presence of cord-wrapped paddle impressions (Matson

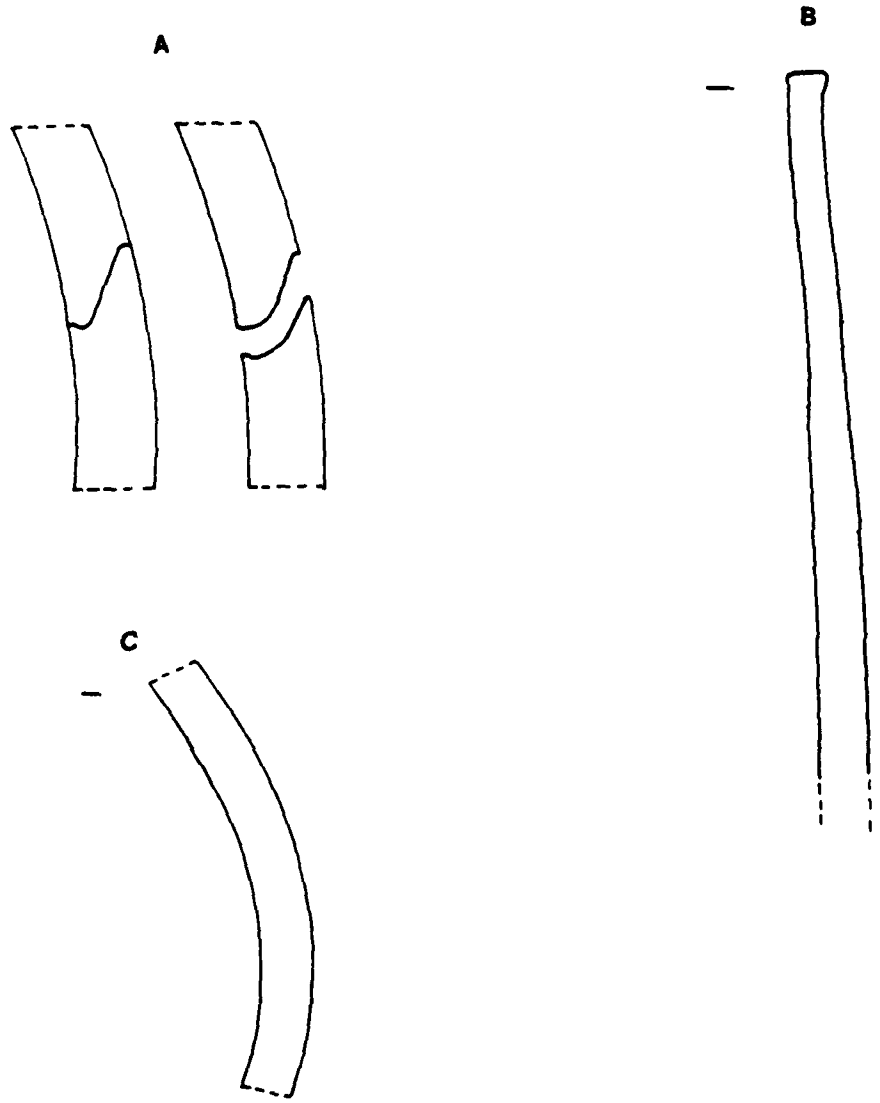

Figure 7.5. Fracture and vessel shapes: (a) coil overlap type of coil juncture fracture; (b) observed upper body shape of a postulated conoidal vessel; (c) strongly curved shoulder shape; (a, no scale; b and c, actual size); "-" denotes vessel interior.

1969:593). This technique has been used in conjunction with coiling and lump modeling processes of vessel formation. The fact that sherds with coil juncture fractures are cord-wrapped paddle impressed is evidence for paddling being used in conjunction with coiling. Evidence for lump modeling along with the predominant occurrence of cord-wrapped paddle impressed elements, may indicate these two techniques were also used together.

However, cord-wrapped paddle impressions are sometimes regarded as surface finishing or decorative treatments (Shepard 1956:186). If a cord-wrapped paddle was used after vessel shaping, the above postulations concerning vessel formation and shaping would be rejected. No evidence was observed to demonstrate either sequential position conclusively.

The sample was stratified into groups containing similar pottery vessel environments, e.g., rims, shoulders, in an effort to infer possible vessel shapes. One basal sherd is in the sample, but it is too small for vessel shape reconstruction purposes. All body sherds are sufficiently small to be worthless in yielding reliable information concerning pottery vessel shape. A combination rim/lip/neck sherd indicates one shape is a conoidal vessel. The rim is very small, the neck being almost coincident with the lip. The area between the neck and shoulder appears to be large. This is only a guess, as the vessel circumference is still increasing where the sherd terminates. The sherd profile is illustrated in Figure 7.5b. One shoulder and two neck sherds have considerable curvature, indicating that vessels were present with more pronounced rims and shoulders than the above example (Fig. 7.5c). One rim has an incurved shape, the remainder are straight.

Exterior and Interior Surface Elements

Surface elements are recorded noting the sequence of application. In many cases, evidence for techniques used early in the finishing sequence may have been obliterated by later activities. Therefore, some steps in the sequence may be missing. The numerically predominant exterior surface element is the cord-wrapped paddle impression; occurring on 141 of the 211 (four rim/lip sherds) sample sherds. In most cases (121), cord impressions were smoothed over and partially obliterated with a pliable tool. This is evidenced by the nature of plastic flow in the impressions. Pliable tool smoothing results in evenly curved edges of individual cord impressions (Fig. 7.6a). One calcite tempered sherd has evidence of only pliable smoothing on the exterior surface; it is similar in other respects to the rest of the cord marked, calcite tempered sherds. It is possible that this sherd represents an area on a cord marked vessel where cord impressions have been obliterated by smoothing. The same may be true of two indurated clay tempered sherds with only pliable smoothing evident on the exterior surface. Three sherds with cord impressions have been smoothed with a nonpliable tool subsequent to the application of a cord-wrapped paddle. This is evidenced by cantilevered edges on individual impressions, visible in cross section (Fig. 7.6b). A few sherds have been smoothed with pliable and/or nonpliable tools with no other surface elements identifiable.

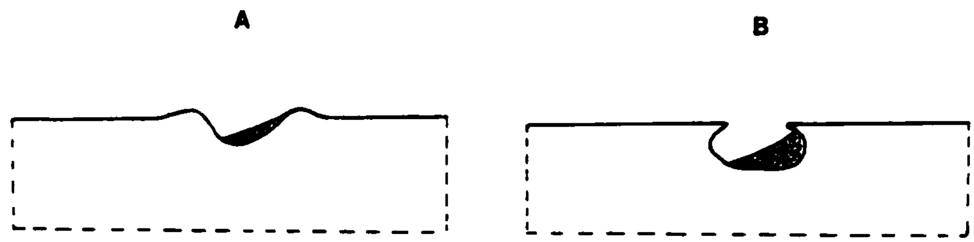

Figure 7.6. Smoothing modes: (a) pliable tool smoothing applied over cord-wrapped paddle impression; (b) nonpliable tool smoothing applied over cord-wrapped paddle impression. (exaggerated scale)

Dentate stamping, trailed lines, punch embossing, and tool impressions are also present. In most cases, the order of application of these is determinate. The sequence is determined by evidences of plastic flow. For example, dentate stamping was accomplished after trailed lines had been placed on a vessel as evidenced by the fact that dentate stamped impressions overlapped the trailed line. In other cases, the application of a tool caused plastic flow which deformed the original shape of a previously applied tool mark. Sherds that exhibit the defining characteristics of the above three modes do not show evidence for cord-wrapped paddle impressions.

Where it could be determined, all but two sherds have evidence of only smoothing on the interior surface. Forty-three have only pliable tool and 75 have only nonpliable tool smoothing. One sherd has evidence for pliable tool after nonpliable tool smoothing. This unique sherd, where evidence for one smoothing mode was not obliterated by the application of a second smoothing procedure, may indicate that other pliable tool smoothed sherds had been previously smoothed with a nonpliable tool. The two remaining sherds with determinate interior surface treatments are rim/lip sherds. One has pliable tool smoothing over cord-wrapped paddle impressions. The other was smoothed with a nonpliable tool, then a punch emboss was applied from the interior, and finally the rim, at its junction with the lip, was smoothed with a pliable tool.

Firing the Vessel

Dark core colors can be used in investigating the procedure and degree of low temperature firing. Dark cores indicate that pottery has not been sufficiently fired with respect to time and temperature to eliminate dark color. Clay will blacken when it is first fired, but will then lighten as organic matter is removed through oxidation. Because temperature and time are interrelated variables and postfiring color is also related to porosity, it is difficult to determine their range of values from color alone. Dark colors indicate only that the clay has not been oxidized and lighter colors show that it has. This does not mean that the pottery was fired in a reducing

or oxidizing atmosphere. In addition, individual pottery vessels can show a great deal of color variation (Matson 1969:595-96; Shepard 1956:213-22). Observations regarding color were made with these limitations in mind.

All but 14 sherds had black or gray core colors, indicating that firing time and/or temperature were inadequate to completely oxidize the sherd. Interior surfaces are generally darker than exteriors and in many instances are darker than cores. This could be a result of firing technique or subsequent use. Only 13 sherd exterior surfaces were black or gray which is indicative of incomplete oxidation.

The best information concerning firing temperature is deduced from calcite tempered sherds. Carbonates may decompose upon firing; if calcite is heated to temperatures between 650° and 898° C., carbon dioxide is evolved leaving calcium oxide. This then hydrates to form calcium hydroxide. However, low temperatures or high carbon dioxide concentrations slow the reaction rate. Therefore, when firing is short, changes may not occur until temperatures of 750° to 800° C. are reached (Shepard 1956:30). The calcite temper observed in the present sample is not decomposed, nor does it resemble reformed cryptocrystalline calcium carbonate. Therefore, calcite tempered pottery vessels were fired at temperatures below the 750° to 800° C. range.

Pottery Vessel Use

The only indications of use observed are the presence of charred organic matter and smudging. Smudging could have come about during the firing process (Shepard 1956:88-90). Therefore, the only unambiguous evidence for use is carbonized organic matter that is adhered to sherd surfaces; this is present on the interior of 13 sherds. It is doubtful that this restricted occurrence would be a result of any postdepositional transformations. The sherds probably represent cooking pots with food scorched to the inside surface.

Summary

The above narrative summarizes some steps and sequences of pottery vessel manufacture and use as inferred from procedural modes. Combinations of all modes have not been detailed. Preliminary analysis indicates that there is a tremendous amount of variation present in the collection. However, it appears doubtful that all of it represents significant activities in terms of repetition and linearity. Many attributes were observed only once, therefore, they cannot be demonstrated to represent meaningful variation in terms of the systemic context of the represented occupation or occupations. Of course, those unique instances of attributes which indicate a procedural mode may be due to small sample size; especially in the rim/lip sample. On the other hand, some of this might be individual variation or variation due to the vagaries of certain manufacturing techniques, e.g., the variability in sherd color. Those procedural modes indicating relevant human behavior are detailed below.

Pottery vessel construction techniques and uses derived from inferred procedural modes are presented in Table 7.2. The behavior chain is based

Table 7.2. Behavioral chain model for the manufacture and use of pottery vessels at 14BU9.

Body Manufacture:

Temper Addition (number of sherds)	Forming the Vessel	Forming, Shaping, and/or Finishing the Vessel	Firing the Vessel	Using the Vessel
limestone and indurated clay (1)	lump modeling and/or coiling	interior: indeterminate exterior: indeterminate	exterior oxidized	indeterminate
indurated clay and sand (1)	lump modeling and/or coiling	interior: nonpliable smoothing exterior: nonpliable smoothing then trailed line then dentate stamping	exterior unoxidized	indeterminate
grog (3)	lump modeling and/or coiling	interior: nonpliable smoothing exterior: indeterminate (1)	exterior oxidized	indeterminate
		interior: pliable smoothing exterior: cord-wrapped paddle impressed (1) then pliable smoothing	exterior oxidized	indeterminate
calcite (34)	lump modeling and/or coiling conoidal shape	interior: nonpliable smoothing exterior: cord-wrapped paddle impressed (25) then pliable smoothing	exterior oxidized, fired below 750-800° C	cooking (9)
	shape unknown	interior: nonpliable smoothing exterior: pliable smoothing (1)	same	indeterminate
coarse sand (23) large quantity added	lump modeling and/or coiling	interior: nonpliable smoothing exterior: cord-wrapped paddle impressed (4) then indeterminate smoothing	exterior oxidized	indeterminate
		interior: nonpliable smoothing exterior: cord-wrapped paddle impressed (8) then pliable smoothing	exterior oxidized	indeterminate

Table 7.2. (Continued)

Temper Addition (number of sherds)	Forming the Vessel	Forming, Shaping, and/or Finishing the Vessel	Firing the Vessel	Using the Vessel
coarse sand (continued)	lump modeling and/or coiling	interior: pliable smoothing exterior: cord-wrapped paddle impressed (1) then pliable smoothing	exterior oxidized	indeterminate
		interior: pliable smoothing exterior: nonpliable smoothing (1) then trailed line	exterior unoxidized	indeterminate
fine sand (6) 20 to 40% by weight added	lump modeling and/or coiling pronounced shoulder	interior: pliable smoothing exterior: pliable smoothing (1)	exterior oxidized	indeterminate
	shape unknown	interior: nonpliable smoothing exterior: cord-wrapped paddle impressed (4) then pliable smoothing	exterior oxidized	cooking (1)
	shape unknown	interior: nonpliable smoothing exterior: pliable smoothing (1)	exterior oxidized	cooking (1)
indurated clay (97)	lump modeling and/or coiling shape unknown	interior: indeterminate exterior: cord-wrapped paddle impressed (1) then pliable smoothing	exterior oxidized	indeterminate
	shape unknown	interior: nonpliable smoothing exterior: cord-wrapped paddle impressed (12) then pliable smoothing	exterior oxidized	indeterminate
	pronounced shoulder	interior: pliable smoothing exterior: cord-wrapped paddle impressed (23) then pliable smoothing	exterior oxidized	indeterminate
	lump modeling and/or coiling shape unknown	interior: pliable smoothing exterior: cord-wrapped paddle (2) impressed	exterior oxidized	indeterminate

Table 7.2. (Continued)

Temper Addition (number of sherds)	Forming the Vessel	Forming, Shaping, and/or Finishing the Vessel	Firing the Vessel	Using the Vessel
indurated clay (continued)	shape unknown	interior: pliable smoothing exterior: pliable smoothing (2)	exterior oxidized	indeterminate
	shape unknown	interior: nonpliable smoothing exterior: nonpliable smoothing (7)	exterior oxidized	indeterminate
	shape unknown	interior: pliable smoothing exterior: nonpliable smoothing then trailed line then tool impressions, round, oblique angle and dentate stamping (1) or: nonpliable smoothing then trailed line then tool impressions, round, oblique angle or dentate stamping (3) or: any of the above procedural modes applied singly (4)	exterior oxidized	indeterminate
Rim/Lip Manufacture:				
calcite (2)	indeterminate, conoidal shape	interior rim: non-pliable smoothed then pliable smoothed (2) exterior rim: cord-wrapped paddle impressed then pliable smoothed interior lip: pliable smoothed exterior lip: pliable smoothed rim shape: straight lip form: lip mode 14	oxidized, fired below 750-800^{o} C.	cooking (1)

Table 7.2. (Continued)

Temper Addition (number of sherds)	Forming the Vessel	Forming, Shaping, and/or Finishing the Vessel		Firing the Vessel	Using the Vessel
indurated clay (5)	indeterminate	interior rim: pliable smoothing exterior rim: cord-wrapped paddle impressed then pliable smoothed interior lip: pliable smoothed exterior lip: cord-wrapped paddle impressed then pliable smoothed rim shape: straight lip form: lip mode 15	(1)	oxidized	indeterminate
		interior rim: indeterminate exterior rim: indeterminate interior lip: pliable smoothed exterior lip: pliable smoothed rim shape: straight lip form: lip mode 12	(1)	oxidized	indeterminate
		interior rim: non-pliable smoothed then pliable smoothed exterior rim: non-pliable smoothed then tool impression, round, oblique angle then pliable smoothing interior lip: non-pliable smoothing then pliable smoothing exterior lip: non-pliable smoothing then tool impressions, round, oblique angle then pliable smoothing rim shape: incurved lip form: lip mode 16	(1)	oxidized	indeterminate

Table 7.2. (Continued)

Temper Addition (number of sherds)	Forming the Vessel	Forming, Shaping, and/or Finishing the Vessel	Firing the Vessel	Using the Vessel
indurated clay (continued)		interior rim: cord-wrapped paddle impressed (1) exterior rim: cord-wrapped paddle impressed interior lip: indeterminate exterior lip: indeterminate rim shape: straight lip form: indeterminate	oxidized	indeterminate
		interior rim: pliable smoothing (1) exterior rim: pliable smoothing then trailed line interior lip: pliable smoothing then trailed line then dentate stamping exterior lip: pliable smoothing then trailed line then dentate stamping rim shape: straight lip form: lip mode 17	oxidized	indeterminate
indeterminate (2)	indeterminate	interior rim: non-pliable smoothing then punch emboss, oblique angle then pliable smoothing (1) exterior rim: non-pliable smoothing then tool impressions, round, oblique angle then pliable smoothing interior lip: non-pliable smoothing then pliable smoothing exterior lip: non-pliable smoothing then pliable smoothing	oxidized	indeterminate

Table 7.2. (Continued)

Temper Addition (number of sherds)	Forming the Vessel	Forming, Shaping, and/or Finishing the Vessel	Firing the Vessel	Using the Vessel
indeterminate (continued)		rim shape: incurved lip form: lip mode 16		
		interior rim: indeterminate (1) exterior rim: cord-wrapped paddle impressed then pliable smoothing interior lip: pliable smoothing exterior lip: cord-wrapped paddle impressed then pliable smoothing rim shape: straight lip form: lip mode 15	oxidized	indeterminate

on temper addition modes, surface modes and/or elements, rim shape, lip modes, color observations, and use modes. A great degree of variability is present. If other modes were incorporated or surface element orientations were used in the analysis, variability would increase. However, the added complexity is beyond the scope of this paper. Some unique occurrences of attributes representing procedural modes are incorporated into the behavior chain model. Although these cannot be presently demonstrated to be relevant, an enlarged sample size might prove them to be so; hence their inclusion. Numbers in parentheses in Table 7.2 indicate number of sherds with attributes indicative of the listed modes. Due to indeterminacies, the total does not equal 211.

In the behavior chain summary (Table 7.2), only exterior surface color is tabulated. This is done to eliminate some variation and concomitant unmanageability. Indurated clay tempered body sherds which exhibited trailed lines, dentate stamping, and/or tool impressions are combined into one manufacturing sequence with a set of possible decisions, rather than separated. This is done because due to the vagaries of pottery vessel breakage, all those procedural modes could have been represented on a single vessel. This is supported by the fact that, in one case, they do occur on a single sherd.

The model is divided into two portions, body and rim/lip manufacture. Calcite tempered sherds might all be representative of the same pottery vessel manufacturing procedure. Indurated clay tempered rim/lip sherds with dentate stamping and a trailed line may be associated with the same manufacturing process as those body sherds exhibiting similar attributes.

Conclusions

The procedure of pottery vessel manufacture and variability therein has been outlined. The following hypotheses are proposed to explain observed variability: (1) the site represents several ceramic-bearing components separated horizontally and/or vertically, (2) variability is due to contemporaneous, but different pottery vessel manufacturing traditions, (3) observed differences are due to pottery vessel construction in different social contexts within one occupation, (4) pottery vessels were constructed differently for different uses, e.g., cooking, storage, or ceremonial purposes, (5) variation is due, in part, to pottery vessels of nonlocal manufacture being introduced into the site. All hypotheses are difficult to test because only nine sherds were recovered from subplowzone proveniences; feasibility of the alternatives is discussed below.

Some variability may be a result of sherds being associated with occupations of different chronological placement. Calcite tempered, cord-wrapped paddle impressed, conoidally shaped pottery vessels are associated with radiocarbon dates of A.D. 607 ± 240 and A.D. 828 from other sites in the Central Plains (Johnson n.d.). Zoned, dentate stamped ceramics in southeastern Kansas are associated with dates from A.D. 900 ± 100 to A.D. 990 ± 60 and similar pottery from Kansas City Hopewell sites dates from around A.D. 1 to A.D. 500 (Johnson n.d., 1976). Thin, sand tempered, cord-wrapped paddle impressed ceramics are associated with the Great Bend occupations in Rice County, Kansas (Wedel 1959:242). Wedel's description compares favorably with four cord marked sherds tempered with fine sand from the 14BU9 surface

Table 7.3. Temper and exterior surface elements of pottery sherds from level 2, 14BU9.

Exterior Surface Finish	Temper Calcite	Coarse Sand	Fine Sand	Indurated Clay	Indeterminate
smoothed	-	-	1	1	-
cord-wrapped paddle impressed, then smoothed	1	1	-	2	1
indeterminate	-	-	-	2	-
total	1	1	1	5	1

collection. This presents the possibility of post Woodland occupations being represented in surface materials.

However, not all variation is potentially explainable in terms of temporal variation. Calcite, coarse sand, and indurated clay tempered sherds with smoothed over cord-wrapped paddle impressions, and fine sand and indurated clay tempered sherds with no cord impressions were all recovered from level 2 (20-30 cm.) of the 1978 excavations (Table 7.3). The excavation space probably represents a series of related occupations, and therefore, ceramics recovered from level 2 are contemporaneous. This leaves open the possibility that variation is due to contemporaneous, but different traditions and/or that vessels were manufactured in different social contexts within an occupation. Only calcite and sand tempered sherds have evidence that they were used for cooking; other sherds may have come from storage vessels. However, most sherds have eroded surfaces, therefore, absence of charred organic matter may reflect preservation biases rather than different vessel uses. Sherds with dentate stamping, trailed lines, and/or tool impressions may represent vessels of nonlocal manufacture. Some of these sherds contain a mineral inclusion that is not present in sherds without these three procedural modes; possibly indicating that clay from a different, perhaps nonlocal, source was used for constructing vessels with these modes. As mentioned above, similar sherds with similar surface modes are found in Kansas City Hopewell sites and Cooper variant sites in southeast Kansas (Johnson n.d.).

The small sample of excavated sherds limits testing of any hypotheses concerning ceramic variability. The alternatives all seem plausible, given the small sample. Observed variability may be explainable in terms of all hypotheses; no one hypothesis probably accounts for all variation.

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CHAPTER 8

MAMMALIAN FAUNA 14BU9

Chérie E. Haury

Abstract

This analysis is directed toward the consideration of food procurement strategy, bone utilization, disposal, and attritional forces active at 14BU9. By examining the evidence of disturbance and attrition of bone elements in the El Dorado phase levels, hypotheses are suggested that state: (a) there was an intensive utilization of bone by-products which resulted in considerable destruction of bone elements; (b) bone waste was systematically disposed of or otherwise rapidly cut off from extensive exposure. Some artiodactyl bone elements which are large and dense enough to have had a good probability of surviving attritional forces at this site are consistently absent from the assemblage. This pattern suggests a single kill; heavy butchering strategy may have been used in the procurement of these animals.

Introduction

One of the overall objectives of the research in the El Dorado Lake area is to acquire an understanding of the synchronic and diachronic interrelationships between prehistoric subsistence systems and the environmental conditions and resources to which they were adapted (Leaf 1976:28). Analysis of excavated faunal remains is an important means of reaching this goal. Faunal analysis can provide data concerning differential utilization of resource zones by a prehistoric population, seasonal variation in resource procurement, and relative importance of species in prehistoric diets (Chaplin 1971; Gilbert 1973; White 1953). Study of the condition and distribution of the bone elements can also provide data related to butchering practices, utilization of bone (e.g., tools, pottery temper, bone grease, etc.), disposal, and attritional processes active at the site during and after its occupation (Binford and Bertram 1977; Brain 1976; Chaplin 1971; Frison 1971, 1973, 1974, 1978).

To facilitate the formulation of hypotheses with which to guide excavations and data collection in the Archaic levels of the Snyder site, 14BU9, re-analysis of the fauna recovered during previous work at the site (Grosser 1971, 1977) has been undertaken. Considerable discussion of environmental implications, utilization of resource zones, prehistoric diet, and diachronic change can be found in Grosser's (1977) analysis. The present research is directed toward the consideration of food procurement strategy, bone utilization, disposal, and attrition. Although only a single component, the El Dorado phase, is dealt with, the hypotheses developed are also relevant to consideration of other components and can be used for comparative study.

Attritional Processes

Before information regarding regularities in human behavior can be obtained from a faunal assemblage the researcher must be aware of biases introduced into the sample post-depositionally. There are a variety of physical and chemical agents which may remove, relocate, and add to the original faunal assemblage (Medlock 1975:227). It is necessary to be able to recognize these changes in order to recover data providing information about human behavior at the site. By attempting to discover why the bones are in the condition they are in, hypotheses can be constructed which attempt to predict the nature of the faunal remains at the Snyder site.

The effects of weathering are evidenced on bones by cracked, powdery, exfoliated surfaces, and by lateral cracks on teeth. This deterioration will destroy small, frail bones first, tending to bias a sample in favor of large, dense elements. It is useful, therefore, to take note of differential weathering of elements of similar size and density for this would suggest the possibility of variations in the utilization or disposal of the bones by the occupants of the site. For example, burning and boiling are food processing techniques which will affect the response of bone to chemical weathering. Burning carbonizes bone, tending to protect it from organic decay while bone which has been roasted or boiled loses much of its organic structure and becomes brittle, crumbly, and porous (Chaplin 1971:15).

Animals will also alter the faunal record at a site. Domestic dogs, coyotes, raccoons, opossums, skunks, squirrels, and rodents are among the common gnawing, scavenging animals which are likely to have rooted through refuse discarded at the Snyder site during and after its occupation. The activities of these animals will rearrange the context of the bone elements and may alter or destroy the bones themselves. Markings on bone made by animals are the evidence which will indicate that an assemblage has been altered. Tooth perforation marks, gnawing, "scooping out", partial digestion, and spiral fracturing from epiphyseal ends are features to be watched for (Bonnichsen 1973:14). Gnawing, the process of drawing teeth across the surface of the bone, is an activity of both rodents and canids. It can be recognized by short, irregular scratches usually located on the shafts of long bones, perpendicular to the long axis. Rodents gnawing, illustrated in Figure 8.1, can be detected by minute striations caused by the division between their incisors (Miller 1975:212). Predators and scavengers tend to chew the cancellous areas at the epiphyseal ends of bone elements. This results in the "scooped out" appearance of the compact bone, splintering, and spiral fracturing directed from the epiphyseal ends, and tooth perforation marks (Bonnichsen 1973:16). Perforations made by the canine teeth of a carnivore have a rough outline with small fractures around the periphery of the opening as opposed to the smooth, slightly tapered edges of a hole made by drilling (Miller 1975:214). Bone which has passed through an animal or human digestive system often exhibits a scalloped surface, very sharp edges, and circular holes (Bonnichsen 1973:16). Small and/or soft bones, when ingested, may be completely digested and, thereby, removed completely from the archeological record.

Relocation and intrusion of faunal elements can often be inferred from indirect evidence. Roden burrows, root molds, and erosional features

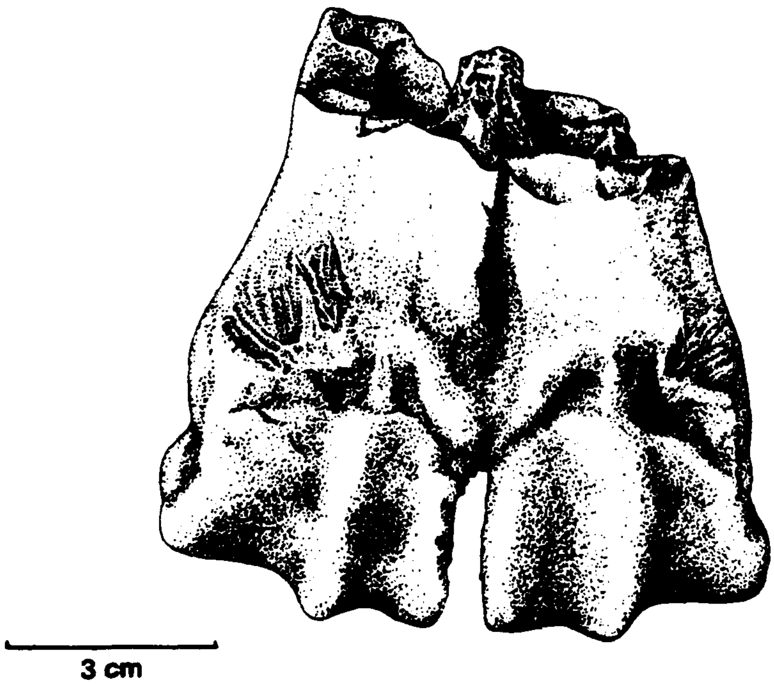

Figure 8.1. Distal portion of a Bison metacarpal showing marks characteristic of rodent gnawing.

provide evidence of an area's disturbance (Medlock 1975:228). Moles, voles, mice, gophers, turtles, lizards, and snakes are among the creatures who dwell or hibernate underground and may rearrange or become a part of a faunal assemblage. In fact, these creatures often prefer burrowing in loose, organically rich midden deposits and are common in archeological faunal collections. Intrusive specimens are often completely or nearly articulated and, if they intruded some time after the site's occupation, their bones may not appear to be as extensively weathered as culturally deposited elements.

The manner in which bone refuse is disposed of and the influence of the depositional environment are factors further influencing preservation. Bone, if discarded on an exposed ground surface, will begin to dry and develop longitudinal and transverse cracks which eventually penetrate the marrow cavity and the surface will become powdery and exfoliated (Miller 1975:217-8) (Fig. 8.2). Exposed bone is also susceptible to effects of trampling and is easily available to scavenging animals.

Rapid burial through accumulation of debris in trash pits or deposition of sediments is generally more conducive to survival of bone elements. Burial minimizes the effect of drying and temperature changes to the extent

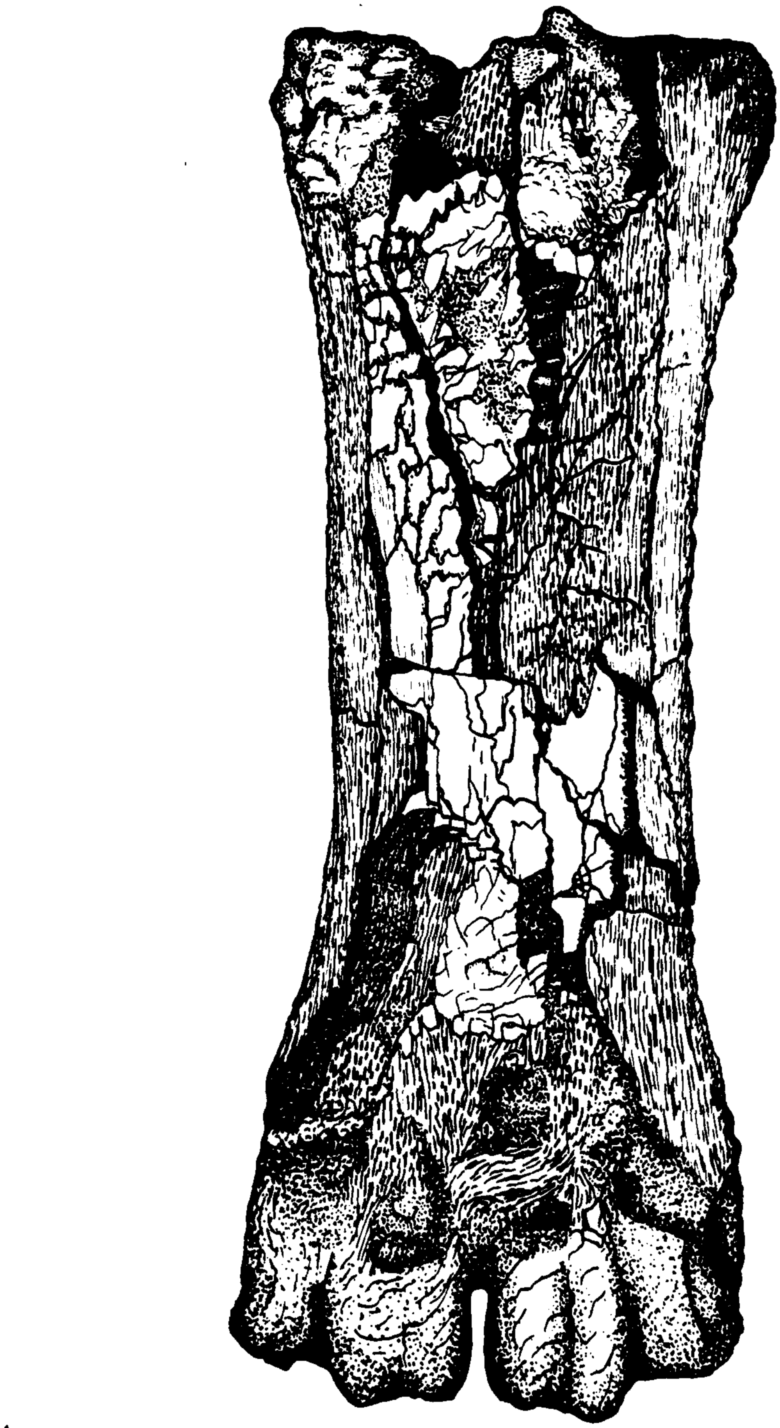

Figure 8.2. Cracking, exfoliation, and powdering exhibited on a Bison metacarpal from 14BU9.

that few cracks and fractures occur (Miller 1975:220). Once buried, the effect of bacterial decay will depend on the acidity of the depositional environment, aeration of the soil, and the amount of water percolating through the soil (Chaplin 1971:16). Bone is poorly preserved in aerated, acid soils with freely percolating ground water. Preservation is enhanced by burial in waterlogged or very dry soil, which retard bacterial action, and clays which slow water percolation. These conditions can be extremely localized and may vary within a site as a result of human activity. It has been suggested that bone associated with limestone tends to be well preserved while bone found in environments of high organic content are crumbly and chalky in appearance (Klippel 1969:32). For example, limestone roasting pits will have different chemical environments than refuse pits with a high organic content.

In summary, it is clear that an excavated faunal sample is far removed from being a complete representation of what was originally deposited. Erosion, decay, animal activity, growing plants, and agricultural activity may remove, relocate, and add to the fauna found in an archeological site. These agents do not act equally on all bone elements. The rate and intensity of their action is dependent upon the rate of burial, burial environment, and the cultural treatment prior to disposal. Study of the kind and extent of physical alteration exhibited on bone elements can infer something about cultural utilization and disposal of bone. Such analysis will also suggest the manner in which the assemblage has been biased by post-depositional processes.

Faunal Procurement and Utilization

Ethnographic research (Binford and Bertram 1977; Bonnichsen 1973; Marshall 1976; Tanaka 1976; White 1952) and detailed analysis of faunal collections from large kill sites (Frison 1971, 1973, 1974, 1978; Kehoe 1976; Lorrain 1968) provide information related to butchering procedures, especially of larger ungulates, and various cultural methods of processing bone. Depending on the intensity of deterioration, cutting, chopping, and crushing marks may be observed on bone elements. These provide evidence of the process by which an animal was dismembered. In order to establish patterns suggestive of butchering procedures the sample must contain a large number of similar elements bearing similar markings. In a small or diverse collection such patterns are difficult or impossible to detect. However, identification of bone elements may reveal consistencies in presence or absence of certain members. With due consideration of attritional processes discussed above, butchering practices and/or food preferences may thus be suggested (Gilbert 1973:4). This study will also provide information about the decisions made when processing a kill. It must be understood that every kill situation was unique and that a number of culturally determined variables affected the selection of bone elements to be transported to a site and the manner in which they were processed and disposed of.

Three general approaches to butchering practices of prehistoric and modern hunter-gatherers can be outlined: large scale butchering, light butchering, and heavy butchering. Each method involves a variety of

decisions related to how much meat had to be processed, how quickly it had to be processed, how far it had to be transported for final preparation and consumption, and the extent to which anatomic elements such as bone were to be used.

Frison (1971, 1973, 1978) and Lorraine's (1968:102-8) studies of butchering at large antelope or bison kill sites illustrates stylized processing sequences which enabled the butchering of a large number of animals in a short time. This kind of organization would be necessary to prevent the loss of meat by spoilage. Such large scale processing generally consisted of three stages. Primary butchering was done at the kill site, where the animal was skinned and dismembered. Often the skull, portions of the vertebral column, phalanges, carpals, and tarsals were discarded at this point. The major portions of the animal were then removed to a nearby processing area where meat was stripped from the bone and possibly prepared for storage or transport. At this step articular ends of long bones used in stripping meat were discarded along with bone used opportunistically as butchering tools, and bone which does not contain significant amounts of marrow such as cervical vertebrae, metapodials, and pelvic bones. The final stage involved cooking, storage, and consumption of the meat. Scapulae, radii, ulnae, humerii, tibiae, femora, mandibles, and maxillae are bones most frequently associated with this stage. These often are found to have been broken, crushed, boiled, or burned during processing, or reserved for use as tools.

Light butchering was a method used when the kill was far from camp, a small number of people were available to transport meat, or when it was necessary to transport several animals at once (Frison 1978:303; Kehoe 1967: 69). In this case the butchering was done at the kill site and the bones were left behind to lighten the load. A heavy butchering technique was used when it was feasible to carry all or most of the kill back to the living site. Small ungulates like antelope could be carried back whole while larger animals like deer or bison were cut into large sections and transported in that condition (Kehoe 1967:69; Marshall 1976:361; White 1952:338).

Ethnographic study of the !Kung Bushmen hunting offers an excellent example of the decision making processes which determined how a kill was processed and transported back to camp:

> When the kill is made, the hunters have the prerogative of eating the liver on the spot and may eat more of the meat until their hunger is satisfied. If they are far from the band they may eat the parts that are especially perishable or most awkward to carry, like the head, and they may sometimes eat the cherished marrow. They then carry to the band the animal in its parts, bones and all, or, if the animal is very big, they leave most of the bones and cut the meat into strips. The strips dry quickly and thus are preserved before they decay, and they can be hung on carrying sticks and transported more easily than big chunks (Marshall 1976:358).

As can be seen these decisions can greatly influence the type of bone eventually deposited at a given site.

The condition the bone elements are in upon deposition depends on the processing techniques to which thev were subjected. Green bone or spiral fractures are conical or crocentic breaks which are caused by a twisting or torsional force applied to fresh bone. The fracture tends to spiral around the shaft usually terminating short of the cancellous tissue at the ends (Fig. 8.3). These types of breaks do not occur naturally, post-mortem and are usually accepted as evidence that the bones were broken by purposeful human activity (Bonnichsen 1973:24; Miller 1975:220). Long bones are often broken in this manner for marrow extraction, or, they may be broken into smaller fragments and boiled to obtain grease (Bonnichsen 1973:10-1). Such activities result in the deposition of a large number of splinters, fragments, and articular portions of bone elements (Binford and Bertram 1977:94 ; Bonnichsen 1973:11; Frison 1971:266; Marshall 1976: 358).

Bone was also frequently worked into tools or ornaments. Some tools were fashioned with minimal preparation to assist in cutting and stripping muscle during butchering. Since such tools were not curated they were disposed of at the butchering site (Frison 1974:52-6). Projectile points, foreshafts, fleshers, awls, needles, etc., are also types of tools which were manufactured from bone. Most probably these tools were curated with the same care that other cultural implements were.

It can be concluded that decisions required by problems of meat procurement may be reflected in consistencies of appearance or exclusion of particular bone elements in archeological collections. Such patterns may suggest decisions based on size of animal killed, number of animals to be processed in a given period of time, logistics of transportation, and amount of utilization intended for various portions of the animal.

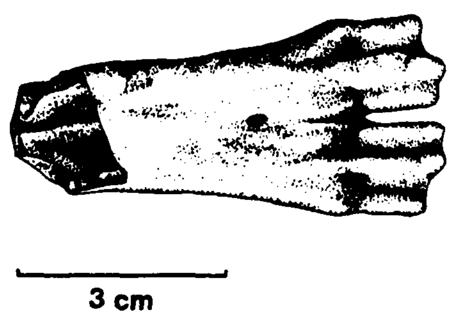

Figure 8.3. Spiral fracture typical of purposeful human activity seen on an Odocoileus metacarpal from 14BU9.

Butchering and processing of bone to obtain marrow, grease, or to use for the manufacture of tools will alter the condition of bone elements and depositional patterns within a site. Careful examination of recovered bone offers information concerning the procurement and utilization of animals for food and raw materials.

Attrition, Procurement, and Utilization at 14BU9

The above discussion is concerned with the kinds of information which can be available through faunal analysis and the limitations which post-depositional influences may impose on such research. Examination of the mammalian fauna from one of the phases at the Snyder site, 14BU9, allows the formulation of hypotheses concerning behavioral redundancies related to meat procurement, disposal of waste, and natural attrition at a specific point in time and space. Research strategies developed in this way can be used to collect comparable data for comparative diachronic and synchronic studies.

Using the osteological collections available at the University of Kansas Museum of Natural History and published material on mammalian osteology (Gilbert 1973; Lawrence 1951; Olsen 1973) the mammalian bone elements from the El Dorado phase levels (80-140 cm. B.S.; Grosser 1977: 37) were identified to genus and, whenever possible, to species (Table 8.1). Only those elements with positive provenience data were used. Dr. Larry Martin, professor of vertebrate paleontology at the University of Kansas, confirmed the identifications presented in Table 8.1. The minimum number of individuals (Table 8.2) representing each taxa was calculated using the "most abundant element" technique (White 1953) modified by separating elements into size and age classes where possible (Chaplin 1971:70).

Direct evidence of butchering in the form of cutting grooves and green bone fractures (Fig. 8.4) can be seen on bone elements of four genera (Table 8.3), Sylvilagus (cottontail rabbits), Antilocapra (pronghorn antelope), Odocoileus (deer), and Bison. This provides the only type of positive indication that these animals were purposefully procured and brought to the site for processing. Tabulation of the elements representing these genera (Table 8.4) suggests that there is a consistent exclusion of the bone elements of the skull, pectoral girdle, and pelvic girdle. This can be diagnosed as a meaningful pattern at least for the three ungulate genera. Bone structure and density in these animals is relatively similar. The consistent exclusion of skull bones, and the heavy, dense horn cores, atlas and axis vertebra, upper teeth, and bone of the pelvic and pectoral girdles while all other general anatomical portions, especially feet, are represented suggests that a heavy butchering technique may have been employed. This would involve removing the skull, and possibly sectioning the animal at the hips and shoulders, and down the spine and transporting these sections to the site for further butchering. This would imply either isolated kill events or a large enough number of workers available to transport the large parts of several animals at one time.

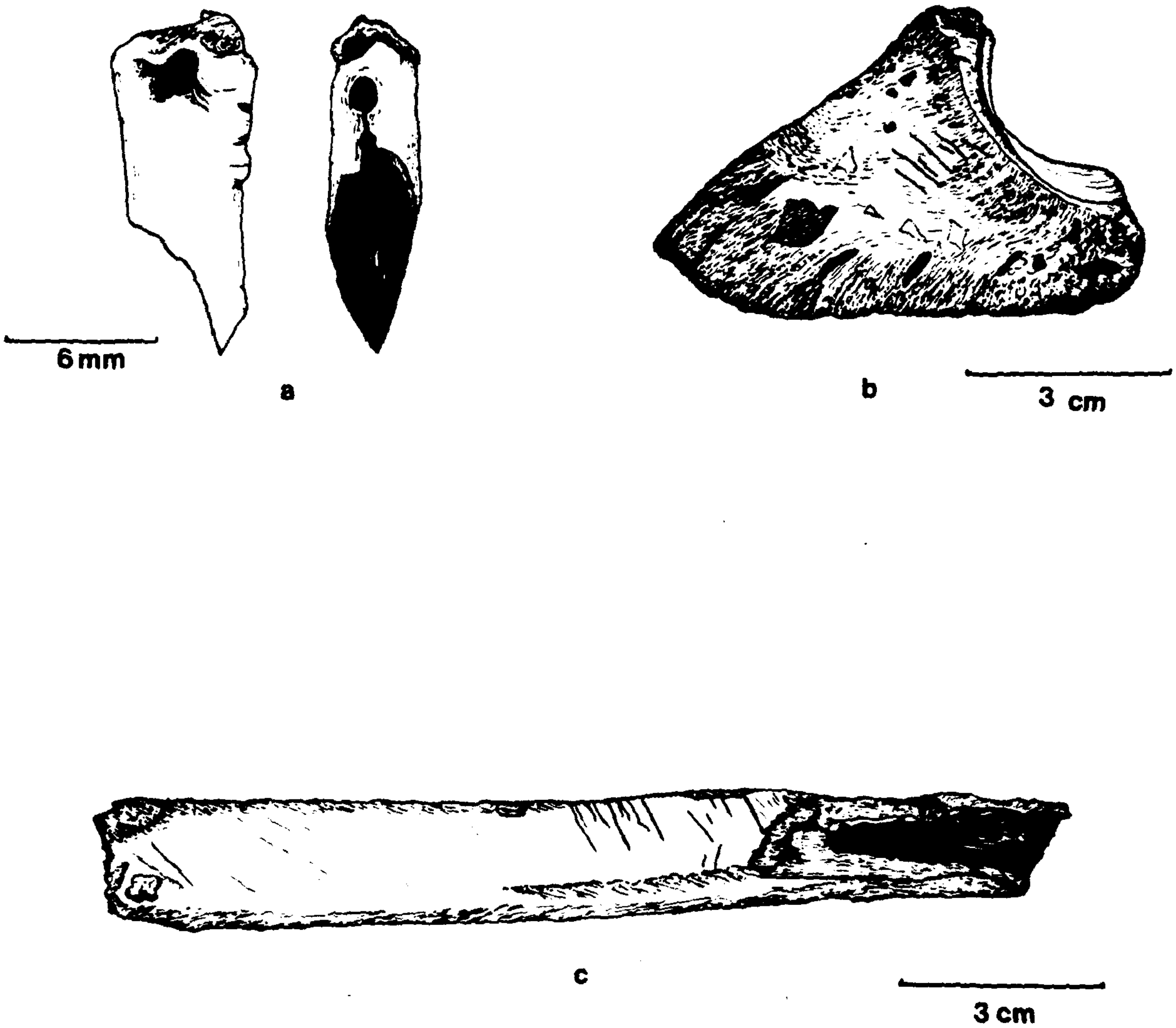

Figure 8.4. Cutting grooves on: (a) Sylvilagus humerus, (b) Bison hoof core, (c) Bison rib.

Table 8.1. Identification of bone elements from the El Dorado phase level of 14BU9.*

Catalog Number	Genus	Species	Element	Side
1 - 78	Sylvilagus	floridanus (?)	mandible fragment and teeth	left
2 - 78	Sylvilagus	floridanus (?)	mandible fragment lower incisor lateral dentition	left left left
A-5930X	Lepus	californicus (?)	upper molars	left
3 - 78	Sylvilagus	floridanus (?)	lower incisor	left
A-32403	Sylvilagus	floridanus (?)	mandible fragment P_3 M_1	left
A-5551X	Sylvilagus	floridanus (?)	maxilla fragment lateral dentition	left left
A-4275	Sylvilagus	floridanus (?)	calcaneum long bone frag.	left unknown
A-4527	Sylvilagus	floridanus (?)	humerus; distal	right
A-5302X	Sylvilagus	floridanus (?)	humerus; distal	right
A-5907X	Sylvilagus	floridanus (?)	humerus; distal misc. fragments	right
4 - 78	Sylvilagus	floridanus (?)	calcaneum femur; distal tibia; distal tooth fragment	right left left unknown
A-32538	Lepus	californicus (?)	calcaneum	right
A-4184X	Sylvilagus	floridanus (?)	P_3 lower incisor lateral dentition misc. fragments	right right right unknown
A-5382X	Sylvilagus	floridanus (?)	3 lateral teeth M_3	unknown left

Table 8.1. (continued)

Catalog Number	Genus	Species	Element	Side
5 - 78	*Lepus*	*californicus* (?)	maxillary frag. lateral dentition mandible fragment	left left left
A-57544	*Sylvilagus*	*floridanus* (?)	mandible fragment P_3	left left
A-32401	*Sylvilagus*	*floridanus* (?)	lateral dentition lower incisor 4 mandible frags.	lower left left unknown
A-5934X	*Lepus*	*californicus* (?)	3 maxillary frags. 2 long bone frags. 1 lateral tooth	right unknown left
A-5172X	*Sylvilagus*	*floridanus* (?)	lower incisor misc. fragments	left unknown
A-5078X	*Sylvilagus*	*floridanus* (?)	humerus; distal	right
6 - 78	*Sylvilagus*	*floridanus* (?)	lower incisor mandible fragment	left left
A-5945	*Geomys*	*bursarius*	upper incisor upper incisor mandible fragment	right left right
A-5945	*Sylvilagus*	*floridanus* (?)	mandible fragment	right
A-5474X	*Geomys*	*bursarius*	upper incisor upper incisor lower incisor lower incisor mandible fragment	right left right left unknown
A-5500X	*Castor*	*canadensis*	upper molar misc. fragments	right unknown
A-5056	*Castor*	*canadensis*	upper incisor fragments	right
A-5076	*Castor*	*canadensis*	lateral tooth fragments	unknown
A-32446	*Procyon*	*lotor*	M_3	right

Table 8.1. (continued)

Catalog Number	Genus	Species	Element	Side
7 - 78	Canis	latrans	mandible and lateral dentition	left
A-4274	Antilocapra	americana	carpal	right
A-32442	Antilocapra	americana	metatarsal frag.	right
A-32527	Antilocapra	americana	tibia; distal	right
A-4527	Antilocapra	americana	carpal	right
A-5946X	Antilocapra	americana	femur; distal	left
A-5767X	Antilocapra juvenile	americana	medipodial; distal frag. tibia; distal misc. fragments	right unknown unknown
8 - 78	Antilocapra	americana	M_3	right
A-5284X	Antilocapra	americana	phalange	right
9 - 78	Odocoileus	sp.?	premolar	left
A-5609X	Odocoileus	sp.?	P_1	right
A-32465	Odocoileus	sp.?	lateral tooth fragment misc. fragments	right unknown
A-32348	Odocoileus	sp.?	M_3	left
A-32360	Odocoileus	sp.?	M_2	left
A-32274	Odocoileus	sp.?	lateral tooth fragment	left
A-32465	Odocoileus	sp.?	mandible fragment lateral dentition	left left
10 - 78	Odocoileus	sp.?	tibia; distal	right
A-5807	Odocoileus	sp.?	medipodial frag.	unknown
A-5600X	Cervid	?	fragmented tooth	unknown

Table 8.1. (continued)

Catalog Number	Genus	Species	Element	Side
11 - 78	Odocoileus	sp.?	metacarpal	left
A-5563X	Odocoileus	sp.?	tibia; distal	left
A-32582	Odocoileus	sp.?	humerus; prox. fragment	unknown
12 - 78	Odocoileus	sp.?	carpal	unknown
A-5300X	Odocoileus	sp.?	premolar	left
13 - 78	Sylvilagus	floridanus (?)	tibia; distal	right
14 - 78	Spermophilus	sp.?	3rd phalange	right
15 - 78	Scalopus	aquaticus	humerus fragment	left
A-5056	Scalopus	aquaticus	humerus fragment	right
A-5078X	Scalopus	aquaticus	humerus	left
A-5469X	Scalopus	aquaticus	humerus fragment	right
A-42427	Scalopus	aquaticus	humerus fragment	right
A-42682	Scalopus	aquaticus	mandible fragment lateral dentition	left left
A-4479	Antilocaprid	americana	lateral tooth fragment	unknown
A-5079X	Sylvilagus	floridanus (?)	tooth and maxilla fragment	right
16 - 78	Spermophilus juvenile	sp.?	femur	right
A-5862X	Microtus	orcogaster	M_1 lower incisor mandible fragment	right right unknown
A-5079	Scuiridae	sp.?	lower incisor	right
A-5646X	Odocoileus	sp.?	lateral tooth fragment	right

Table 8.1. (continued)

Catalog Number	Genus	Species	Element	Side
A-5474	Odocoileus	sp.?	lateral tooth fragment	right
A-5474	Sylvilagus	floridanus (?)	mandible frag.	left
A-5843	Odocoileus	sp.?	tarsal	left
A-42167	Mephitis	mephitis	tibia	left
A-4470	Odocoileus	sp.?	lateral tooth fragment	left
A-5019X	Bison	bison	sesamoid bone	right
A-32428	Bison	bison	femur (?) frag.	unknown
A-4275	Bison	bison	lower incisor	unknown
A-32507	Bison	bison	carpal	unknown
A-32348	Bison	bison	M_3	right
A-5302X	Bison	bison	lower incisor	left
A-4140	Bison	bison	carpal	unknown
A-325146	Bison	bison	3rd phalange	right
A-32167	Bison	bison	mandible & M_3 humerus; distal misc. long bone fragment	right right unknown
A-32587	Bison	bison	2^{nd} phalange	left
17 - 78A	Bison	bison	tibia; distal	right
17 - 78B	Bison	bison	medipodial; dist.	unknown
17 - 78C	Bison	bison	medicarpal; prox.	left
17 - 78D	Bison	bison	rib misc. fragments	right unknown
A-5386	Bison	bison	sesamoid bone	right

Table 8.1. (continued)

Catalog Number	Genus	Species	Element	Side
A-4189	*Bison*	*bison*	cervical vertebra	--
A-32813	*Bison*	*bison*	rib	left
A-5750X	*Bison*	*bison*	mandible frags. lateral dentition lower incisor medicarpal frag. misc. fragments	right right right right unknown
A-5956	*Bison*	*bison*	epipheses of medicarpal ulna fragment	 right right
A-32262	*Bison*	*bison*	metacarpal; prox.	left
18 - 78	*Bison*	*bison*	lower incisor	unknown
A-32823	*Bison*	*bison*	2nd phalange 2nd phalange	left left
A-32731	*Bison*	*bison*	hoof	unknown
A-32810	*Bison*	*bison*	hoof	unknown
A-32805	*Bison*	*bison*	hoof	unknown
A-32816	*Bison*	*bison*	hoof	unknown
A-32510	*Bison*	*bison*	hoof	unknown
A-32844	*Bison*	*bison*	hoof	unknown
A-32822	*Bison*	*bison*	hoof	unknown
A-32755	*Bison*	*bison*	hoof	unknown
A5578X	*Bison* juvenile	*bison*	hoof vertebra spine ? lower incisor	unknown unknown left

*In addition to the taxa listed above five human teeth were found in the collection. Three premolars or, possibly canine teeth, and two molars. All are extremely worn.

Table 8.2. Summary of elements represented by each species and minimum number of individuals represented in the collection.

Genus and Species	Total Number of Elements	Most Abundant Element	Minimum Number of Individuals
Sylvilagus floridanus	47	left mandible	6
Lepus californicus	9	isolated mandible	6
Geomys bursarius	9	paired incisors	2
Castor canadensis	3	isolated teeth	1
Procyon lotor	1	single tooth	1
Canis latrans	1	left mandible	1
Antilocapra americana	10	carpals	3
Odocoileus sp.	17	right tibia	2
Spermophilus sp.	2	- -	2
Microtus orcogaster	1	right M_1	1
Mephitis mephitis	1	left tibia	1
Scalopus aquaticus	6	right humerus	3
Bison bison	43	hoof left medipodial	4

Total Number of Taxa	Total Number of Elements	Total Minimum Individuals
13	151	27

Table 8.3. Evidence of butchering on bone elements from 14BU9.

ELEMENT	GENUS/SPECIES	LOCATION OF MARKS	NUMBER OF MARKS	TYPE OF MARKS	CATALOGUE NUMBER
Third Phalange (Hoof Core)	_Bison_ _bison_	Ventral side near articular surface.	3	Cutting	A32822
Proximal Metacarpal fragment	_Bison_ _bison_	Extend 30 mm. along surface near articular surface. Perpendicular to long axis of bone.	25	Cutting; Green Bone Fracture	A32262
Distal Tibia fragment	_Bison_ _bison_	Random along surface, perpendicular to long axis of bone.	30+	Cutting; Green Bone Fracture	17-78A
Rib, medial fragment	_Bison_ _bison_	Dorsal and ventral surfaces, perpendicular to long axis of bone.	7	Cutting	17-78D
Rib, medial fragment	_Bison_ _bison_	Dorsal surface, perpendicular to long axis of bone.	30+	Cutting; Green Bone Fracture	17-78E
Second Phalange	_Bison_ _bison_	Around circumference perpendicular to long axis of bone.	24	Cutting	A32587
Second Phalange	_Bison_ _bison_	Lower, medial side.	8	Cutting	A32823
Rib, medial fragment	_Bison_ _bison_	Dorsal surface, perpendicular to long axis.	22	Cutting; Green Bone Fracture	A32813

Table 8.3. (continued).

ELEMENT	GENUS/SPECIES	LOCATION OF MARKS	NUMBER OF MARKS	TYPE OF MARKS	CATALOGUE NUMBER
Long Bone Fragment	<u>Bison</u> <u>bison</u>	Inside edge of green bone fracture.	11	Cutting; 3 Green Bone Fractures	A5439
Third Phalange (Hoof Core)	<u>Bison</u> <u>bison</u>	Dorsal surface.	8	Cutting	A32844
Metacarpal fragment	<u>Bison</u> <u>bison</u>	Split longitudinally while green.	-	Green Bone Fracture	A5750X
Humerus, distal fragment	<u>Sylvilagus</u>	Lateral edges, perpendicular to long axis.	30+	Cutting; Green Bone Fracture	A5078X
Humerus, distal fragment	<u>Sylvilagus</u>	-	-	Green Bone Fracture	A4527
Long bone frag. of shaft	<u>Sylvilagus</u>	-	-	Green Bone Fracture, both ends	A4275
Humerus, distal fragment	<u>Sylvilagus</u>	-	-	Green Bone Fracture	A5302X
Long Bone Fragment	<u>Antilocapra americana</u>	-	-	3 Green Bone Fractures	A5284X
Metatarsal fragment	<u>Antilocapra americana</u>	-	-	6 Green Bone Fractures	A32442
Tibia Fragment	<u>Antilocapra americana</u>	Along shaft, perpendicular to long axis.	2	Cutting; Green Bone Fracture	A5483X

Table 8.3. (continued).

ELEMENT	GENUS/SPECIES	LOCATION OF MARKS	NUMBER OF MARKS	TYPE OF MARKS	CATALOGUE NUMBER
Femur Fragment	Antilocapra americana	-	-	Green Bone Fractures	A5946X
Tibia, distal fragment	Antilocapra americana	-	-	Green Bone Fractures	10-78
Tibia, shaft fragment	Odocoileus	Ventral surface, perpendicular to long axis, split lengthwise.	6	Cutting; Green Bone Fractures	A5807
Tibia, distal fragment	Odocoileus	On articular surface.	10	Cutting	A5563
Metacarpal, distal fragment	Odocoileus	Dorsal and ventral surface, parallel and diagonal to long axis of bone.	13	Cutting; Green Bone Fractures	11-78

Table 8.4. Elements representing genera known to have been butchered.

ELEMENT	GENUS			
	Sylvilagus	Antilocapra	Odocoileus	Bison
Horn Cores	-	-	-	-
Skull Parts	-	-	-	-
Maxilla	3	-	-	-
Upper Teeth	3	-	-	-
Mandible	9	-	1	2
Lower Teeth	13	2	12	6
Vertebra	-	-	-	2
Ribs	-	-	-	2
Pectoral Girdle	-	-	-	-
Pelvic Girdle	-	-	-	-
Humerus/Femur	5	1	1	1
Tibia-Fibula Radius-Ulna	2	2	2	4
Medipodials	-	2	2	5
Unidentifiable Long Bones	1	1	-	1
Carpals/Tarsals	2	2	1	3
1st and 2nd Phalanges	-	1	-	4
3rd Phalange (Ungal Phalanx)	-	-	-	9

This general procedure is not necessarily valid for Sylvilagus. The bones of these animals are fenestrated and much less dense than those of artiodactyle. In this case the presence of maxillae and upper dentition may indicate that the frail skulls were present at the site but have been removed by various attritional agents. All the rabbit long bones in this collection were broken while green. If lighter bones were also broken up during butchering their chances of survival were further reduced. Evidence that attrition was high for bone elements of small animals is supported by the fact that all of these creatures are represented primarily by teeth and a few especially dense bones; e.g., calcaneum (see Table 8.1).

The validity of the hypotheses offered above can be tested through further archeological investigation. Increased sample size would lend statistical support to representation of bone elements. Careful screening and water flotation will improve the sample of small or fragmented elements. Further excavation may also uncover areas for special processing techniques.

The small amount of burned bone found in the assemblage (Table 8.5) is comprised of small, unidentifiable fragments. These pieces, along with many of the unburned, unidentifiable fragments, and long bones and ribs of butchered animals display green bone fractures. There are no whole, marrow-bearing bones representing animals known to have been butchered. This includes mandibles, ribs, and medipodials as well as the major marrow bones. Such a high proportion of spiral fractures suggests intensive utilization of bone. No tools manufactured from bone have been recovered. It appears that bone was regularly fragmented, possibly for marrow or grease extraction. Such a process increases the probability of destruction of the remains because boiling and small size render them highly susceptible to attritional forces.

Utilization of non-meat animal resources is suggested by cutting marks visible on a portion of the bison hoof cores (Fig. 8.4b). The meaning of this unusual occurrence can only be speculated. Perhaps the horny hoof covering was being removed for utilization. One possible use for such material could be resin or glue.

Table 8.5. Summary of burned and unburned bone fragments by weight.

	Burned	Unburned	Total
Unidentifiable Fragments	10.9 gm.	138.6 gm.	149.5 gm.
Identifiable Fragments	5.4 gm.	1837.3 gm.	1842.7 gm.
Total	16.3 gm.	1975.9 gm.	1992.2 gm.

Table 8.6 presents a summary of weathering features exhibited by the elements under study. Only a limited number of them evince conditions characteristic of long exposure (powdery surface, exfoliation, and gnawing). The implication is that the majority of the elements were not exposed on the surface for a prolonged period of time. Disposal in refuse pits or other areas of rapid deposition could be responsible for minimizing the detrimental effects of weathering and exposure.

Three surface characteristics are common: original surface, dry-hard or dry-crumbly, and mineralized. These conditions offer evidence of differential preservation within the site. Those elements with smooth, solid surfaces do not appear to be extensively weathered. Possibly they have been sheltered from the action of percolating water and bacteria or, they could represent recent intrusive fauna. Elements of common intruders such as gophers (*Geomys*), mice (*Microtus*), moles (*Scalopus*), and squirrels (*Spermophilus*) evince such surface conditions.

Bones with dry surfaces, crumbly or hard, and mineralized surfaces occur among a number of different genera. Mineralized bones have hard, smooth, lusterous surfaces. Elements with these characteristics have been reported associated with limestone in archeological sites (Artz 1978:238; Klippel 1972:32) and it has been hypothesized that the presence of the limestone serves to protect bone from decay and weathering. Grosser (1977: 24-5; 1970:137) reports that hearths, pits, and limestone concentrations (each with a high limestone content) all contained burned or unburned faunal material. This seems to indicate that the immediate depositional environment is a controlling factor in preservation. Further excavations at the Snyder site offer an opportunity to explicitly test this hypothesis. Careful excavation, observation, and soil testing will be necessary to obtain the proper data to correlate immediate depositional environment and preservation of bone elements.

Conclusions

Based on observations of the frequency and condition of the bone elements recovered from the El Dorado phase level of the Snyder site hypotheses related to procurement and utilization of faunal materials have been formulated. A single kill, heavy butchering procurement system has been proposed as the most common method used in the procurement of artiodactyle. This suggests that the game animals, specifically deer, pronghorn, and bison, were minimally processed at the site of the kill; i.e., the skull removed and the carcass sectioned and transported to the site with remaining bones. Further processing at the site involved final butchering and extensive utilization of bone products which resulted in a considerable amount of breakage. It has also been hypothesized that bone waste was systematically disposed of or otherwise rapidly cut off from extensive exposure.

Further excavation is necessary to test the validity of these hypotheses. The reasons for differential preservation which biases the sample must be investigated. Recovery of bone fragments and correlation of their

Table 8.6. Evidence of attritional processes on bone elements from the Snyder site.

Element	Exfoliation	Lateral Cracking	Transverse Cracking	Powdery Porous	Crumbly Dry	Original Surface	Mineralized Surface	Gnawed	Dry, Hard Surface
<u>Canis</u>									
7-78	-	X	-	-	-	X	-	-	-
<u>Microtus</u>									
A5862X	-	-	-	-	-	-	X	-	-
A5836X	-	X	-	-	-	X	-	-	-
<u>Mephitis</u>									
A42167	-	-	-	-	-	-	X	-	-
<u>Geomys</u>									
A5945	-	X	-	-	-	X	-	-	-
<u>Antilocapra</u>									
10-78	-	X	-	-	X	-	-	-	-
A4275	-	X	-	-	X	-	-	-	-
A32442	-	X	-	-	X	-	-	-	-
A32527	-	X	-	-	X	-	-	-	-
A5946X	-	-	-	-	X	-	-	-	-
A5767X	-	X	-	-	X	-	-	-	-
A5483X	-	-	-	-	-	-	X	-	-
A4527	-	X	-	-	-	-	-	-	X
A5284	-	X	-	-	-	-	X	-	-
A5474X	-	X	-	-	-	-	-	-	X
A5975	-	-	-	-	X	-	-	-	-
A5843X	-	-	-	-	-	X	-	-	-
A5807	-	X	-	-	-	-	X	-	-

Table 8.6. (Continued)

Element	Exfoliation	Lateral Cracking	Transverse Cracking	Powdery Porous	Crumbly Dry	Original Surface	Mineralized Surface	Gnawed	Dry, Hard Surface
A32465	-	X	-	-	-	-	X	-	-
A5563X	-	-	-	-	-	-	X	X	-
11-78	-	-	-	-	-	-	X	-	-
12-78	-	X	-	-	-	-	X	-	-
A5690X	-	-	-	-	-	-	-	X	X
A32465	-	X	-	-	-	-	X	-	-
A32348	-	X	-	-	-	-	-	X	X
A32582	-	-	-	-	-	-	-	-	X
Scalopus									
A42682	-	-	-	-	-	X	-	-	-
A5469X	-	X	-	-	-	X	-	-	-
A42427	-	-	-	-	-	X	-	-	-
15-78	-	X	-	-	-	X	-	-	-
A5056	-	X	-	-	-	X	-	-	-
A5078X	-	X	-	-	-	X	-	-	-
Scuridae									
A5079X	-	X	-	-	-	X	-	-	-
Spermophilus									
14-78	-	-	-	-	-	X	-	-	-
16-78	-	-	-	-	-	-	X	-	-
Sylvilagus									
A4527	-	X	-	-	-	-	X	-	-
A5551X	-	-	-	-	-	-	X	-	-
A5474X	-	-	-	-	-	-	X	-	-
A5445X	-	-	-	-	-	-	X	-	-

Table 8.6. (Continued)

Element	Exfoliation	Lateral Cracking	Transverse Cracking	Powdery Porous	Crumbly Dry	Original Surface	Mineralized Surface	Gnawed	Dry, Hard Surface
6-78	-	-	-	-	-	-	-	-	X
4-78	-	-	-	-	-	-	-	-	X
13-78	-	-	-	-	-	-	-	-	X
A5907X	-	-	-	-	-	-	-	-	X
5-78	-	-	-	-	-	-	X	-	-
A32401	-	-	-	-	X	-	-	-	-
A5079X	-	-	-	-	-	-	X	-	-
A5382X	-	-	-	-	-	-	X	-	-
A5754X	-	-	-	-	-	-	X	-	-
A5934X	-	-	-	-	-	-	X	-	-
1-78	-	-	-	-	-	-	X	-	-
A5172X	-	-	-	-	-	-	X	-	-
A32538	-	-	-	-	-	-	-	-	X
A4184X	-	-	-	X	-	-	-	-	-
A32403	-	-	-	-	-	-	X	-	-
A5302X	-	-	-	-	-	X	-	-	-
A4275	-	X	-	-	-	-	X	-	-
A5078X	-	-	-	-	-	-	X	-	-
Bison									
A32428	X	-	-	X	X	-	-	-	-
A32823	-	-	-	-	-	-	-	-	X
A32587	-	-	-	-	-	-	-	-	X
A5750X	-	X	X	-	X	-	-	-	-

Table 8.6. (Continued)

Element	Exfoliation	Lateral Cracking	Transverse Cracking	Powdery Porous	Crumbly Dry	Original Surface	Mineralized Surface	Gnawed	Dry, Hard Surface
A4140	-	-	-	-	-	-	-	-	-
A32755	-	-	-	-	-	-	-	-	X
A5578X	-	-	-	-	-	-	-	X	X
A32822	-	-	-	-	-	-	-	-	X
A5956	-	-	-	-	-	-	-	-	X
A32262	-	-	-	-	-	-	-	X	X
A4487	-	-	-	-	X	-	-	-	-
A4140	-	-	-	-	-	-	-	-	X
A32805	-	-	-	-	-	-	-	-	X
A32810	-	-	-	-	-	-	-	-	X
A32816	-	-	-	-	-	-	-	-	X
A32731	-	-	-	-	-	-	-	-	X
A32514	-	-	-	-	-	-	-	-	X
A4189	-	X	-	-	X	-	-	-	-
A32348	-	X	-	-	X	-	-	-	-
17-78	-	-	-	-	-	-	-	-	X
A5019X	-	X	-	-	-	-	-	-	X
A5386X	-	X	-	-	X	-	-	-	-
A5751X	-	X	-	-	-	-	-	-	X
A32510	-	-	-	-	-	-	-	-	X

condition and the context of their deposition will be necessary. This will require observations of soil acidity, and the presence of limestone, clay, or organic matter in general level soils and within all features whether or not they contain bone. With these data it will be possible to determine to what extent the immediate depositional environment alters or preserves cultural behavior patterns.

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CHAPTER 9

THE HISTORIC PERIOD

Mary Wilk

Abstract

The historic period in the El Dorado Lake area serves as a model for the Euro-American settlement of the Great Plains during the 19th Century. Focusing on the frontier town, Chelsea, and its translocated manifestation, New Chelsea, three significant periods are defined: pre-settlement, -1856; pioneer period, 1857-1867 (from founding to demise of original Chelsea); and the expansion period, 1868- ca. 1900 (founding of New Chelsea through the end of its functional life). Particular attention is paid to shifts in settlement patterns, building styles, and other material culture traits among these three periods. The chapter concludes with recommendations for future work.

Introduction

Butler County covers 1,445 square miles of south-central Kansas, bordering the geographic region defined as the Great Plains (Kraenzel 1955:3). The gently rolling bluestem-covered terrain of its eastern half is part of the Flint Hills which taper off into relatively level prairie in the western sector. The county is composed of 85% upland and 15% bottomland with the timber principally confined to the bottomland along the two major rivers, the Walnut and the Whitewater, and their numerous tributaries (State Board of Agriculture Report 1874:122).

The area to be included in the El Dorado Lake is located in the north-central part of the county and includes land bordering the Walnut River, north of El Dorado, and its tributaries, Cole, Durechan, Bemis, Satchel and Bird Creeks. Physically it is a good cross section of Butler county with its network of streams, uplands, and rich farmland in the bottoms.

Historically, the El Dorado Lake area can be seen as a model of the Kansas settlement experience. The answers to the questions why and when the settlers came to this area; where they came from; what occupations they chose; and why and how they organized a town are typical reflections of this experience. The area maintains its own degree of uniqueness, of course, as every place does, but not to the extent that it would refute its validity as a reliable model. By interpreting the history of the El Dorado Lake area in this manner, the settler's story takes on broader meaning.

Investigative Procedure

Primary investigation into the impact area began with interviewing 24 local citizens, most of whom were elderly, long term inhabitants. Their

reminiscences were put to practical use during the summer of 1978 in locating historic sites, especially those without surface remains, and in associating names and events with those sites which could then be verified through written records. The data derived from the interviews were coupled with pedestrian field surveys and other documentary data (maps, land records, etc.) to provide the basis for historic reconstruction.

The printed sources consulted are listed in the bibliography but Vol. P., Mooney's History of Butler County, Kansas merits special recognition as do Paul Wallace Gates' numerous books and articles on land policies and agricultural activities in Kansas. The former proved invaluable in providing detailed insight into the lives of the settlers and the latter placed them in a broader cultural context.

Concentrated research was done on the early settlement of the area, particularly as it related to the frontier town, Chelsea (14BU1012), and its relocation hereafter referred to as New Chelsea (14BU1007). The year 1928 served as the upper limit of the project's study period. Two main periods of interest can be defined within this time span: 1857-1867, first permanent white settlement to the demise of Chelsea; 1868- ca. 1900, the founding of New Chelsea to its demise. It is these two periods that are emphasized in the following report.

Pre-Settlement

Prior to Euro-American settlement the county experienced two familiar phases of Plains frontier history. The first was the presence of the Indians on the land and their eventual removal. The second was the appearance of transients, such as explorers, fur traders, freighters, migrating pioneers and miners, who traveled through the area en route to various destinations.

Butler County had been the hunting grounds of the Wichita, from the great bend of the Arkansas; the Kansa, from northeast Kansas; and their linguistic kindred, the Osage, who ranged over the region known as the Osage Plains in eastern Kansas and western Missouri (Bell et al. 1967:245; Mathews 1961:298; Unrau 1971:99; Wedel 1938:119; 1946:3). The vast herds of deer that roamed the valleys and the buffalo that inhabited the uplands made the area attractive for hunting. Elk, antelope, beaver, wildcats, bear, eagles, and turkeys were also abundant (Mooney 1916:5). Although the Wichita, Kansa, and Osage Indians were known to have traversed this region in seach of game and on raiding missions, there are no known records that any of them established a permanent horticultural village site along the Walnut River or its tributaries (in the reservoir area) during the protohistoric period.

Of the various Indian tribes that roamed Kansas, the Osage have been recorded as having the most direct contact with the Walnut River Valley in the 19th century. This was a result of a European-forced separation of the Missouri Osage tribe that brought approximately half of them to relocate in northern Oklahoma and southern Kansas. This move was instigated by the Chouteaus, French fur traders, who had lost their monopoly on the Missouri fur trade and their exclusive, highly prized trading privileges with the Missouri Osage in 1802, to their rival, Manuel Lisa. The Chouteaus moved

their base camp to a new location, at Three Forks (Okla.), from which the Osage continued to hunt and trap beaver for them along the Arkansas, Neosho, and the Verdigrise Rivers (Mathews 1961:280-302).

In their excursions along the Arkansas River to the Walnut River Valley, the Osage eventually wore a well-defined trail across central Butler County (Mooney 1916:432). It crossed south of the present city of El Dorado, coming from the east by way of Rosalia, then crossed the Whitewater River at Towanda and touched the Little Arkansas seven miles north of Wichita. It was from these beginnings that a vital pioneer trail was established in the county. August Pierre Chouteau himself followed this trail in 1815 when he journeyed to the Rocky Mountians to hunt beaver on the sites of the present Colorado Springs and Pueblo, Colorado (Stratford 1934:7).

The Osage did not have access to the resources of the upper Walnut Valley for long. In 1825 the Federal government, interested in surveying a permanent overland route to Santa Fe without obstruction from the Indians, signed a treaty with the Osage which barred them from the land north of the fifth standard parallel (Blackmar 1912, Vol. 1:162). Their land south of this boundary line in Butler County was known as the "twenty-mile strip" (Mooney 1916:64). The sons of Isaac McCoy, the Baptist Indian missionary, were engaged by the government to do the surveying and met with opposition from the Osage who claimed the line was drawn too far south. As a result, there was some friction between early settlers and the Osage. Mainly the problems arose from "sooners", to borrow the expression from later Oklahoma history, who settled on the "twenty-mile strip" before it was obtained from the Indians and opened as preemption land in 1865 (Dykstra 1973:43; Mooney 1916:64).

The Louisiana Purchase of 1803 and the ensuing Lewis and Clark expedition initiated a growing concern among Easterners for more information about their western lands. In 1805 Major Zebulon Montgomery Pike was commissioned by the government to explore "the sources of the Mississippi, and through the western parts of Louisiana, to the sources of the Arkansaw, Kans, La Platte and Pierre Juan rivers" (Macquirre 1899:v). He was the only major explorer to enter Butler County although Stephen H. Long did encounter the Walnut River, which he called the Little Neosho or Stinking Ford, at its mouth on his journey across the Plains in 1819-20 (Thwaites 1905:245).

Pike's travels brought him to the county's northern edge in September of 1806. The map of this journey indicates that he crossed the Whitewater River at its northern tip but did not encounter the Walnut. If he did, Pike did not consider the river significant enough to chart or record. His journal does provide the first graphic description of the native conditions of this area:

> Fri. 12 Sept.: Commenced our march at seven o'clock, and passes some very rough flint hills; my feet blistered, and were very sore. Standing on a hill, I beheld in one view below me, buffaloes, elks, deer, cabrie, and panthers. Encamped on the main branch of Grand River, which had very steep banks, and was deep....The Indians (Pawnees and Osage traveling with him) alluding it was the Kansas hunting

ground, said they would destroy all the game they possibly could. Distance advanced, 18 miles.

Mon. 15 Sept.: From the Verdigrise river our course had lain over gravelly hills, and a prairie country, but well watered by the branches of the Verdigrise, and the White or Grand River. From the dividing ridge, which parts these streams, to the source of the latter, there is very little timber. The grass is short, the prairies high and dry (Macquire 1889:177-78).

The opening of trade relations in 1822 between the United States and Santa Fe, New Mexico, brought a third group of transients through Butler County - the merchant freighters. Caravans, first consisting of pack animals then wagons after 1824, were loaded with cotton, silk and velvet cloth, arms, ammunition, steel, iron and liquor to be traded for silver, gold, beaver pelts, buffalo hides, mules and other raw materials in Santa Fe (Moorhead 1954:15-80). In the early years various Indian trails were used by freighters and dubbed with the name of this destination. One such route was the old Osage Trail. According to legend, this was the trail Baird, McKnight and Chambers followed in 1812 when trade relations with Santa Fe were first attempted (Stratford 1934:7). The permanent Santa Fe Trail, surveyed and properly recognized by 1828, took away much travel from the Osage Trail but the Butler County trail persisted as a thoroughfare to Santa Fe and the Rocky Mountains for some freighters and traders throughout the 19th century (Blackmar 1912, Vol. 1:162; Mooney 1916:432).

Indirectly, it is possible that through their travels the explorers and freighters did more harm than good for the prospective settlement of this region. They succeeded in mapping the Plains and far west for the curious Easterners and established trails, but hindered expansion efforts by condemning in their journals much of the land between Missouri and the Rocky Mountains as uninhabitable. Major Pike's 1808 report to the Government described the area around Butler County as "high and dry" and denounced the Great Plains as uninhabitable because of the lack of wood and water (Macquire 1889:178). Major Long went one step further and mapped the Great Plains as the "Great American Desert" (Hine 1973:74-75). Santa Fe merchant Josiah Gregg (in Commerce of the Prairies 1844, reprint Moorhead 1954) and explorer-frontiersman Francis Parkman (in The California and Oregon Trail 1849, reprint The Oregon Trail 1896) continued to promote this image in their reports. An entry in Parkman's journal reads as follows: "on the verge of the 'Great American Desert' scenery that is not wholly void of interest but at the same time not necessarily pleasant - unending terrain, badger holes, sparce game..." (Parkman 1896:35). It was from these reports that Americans gained their first insight as to the geography of the Plains.

The disappointing news of the sterility of this vast supply of land was offset by the reports in the 1840's of the rich farmland of the far west. According to the claims, California and Oregon were the repository of land-hungry farmers' dreams, with the abundant rainfall, ample timber supply, and fertile land. By 1843, the great migration there was well under way.

The attractiveness of this new frontier brought as many as ten thousand Americans streaming over the Oregon, California and Santa Fe Trails by 1846 (Hine 1973:88-91). Some emigrants from the South made their rendezvous at Fayette, Arkansas, then proceeded northwest until they came to the Osage Trail. They followed this trail across the Walnut River where it intersected with another trail (which was called the California Trail, but was not part of the main California Trail that branched off from the Oregon Trail in Wyoming) which in turn led them to the Santa Fe Trail in McPherson County. Others continued northwestward to strike the Oregon Trail in Nebraska (Mooney 1916:432).

After 1848, the farmers were accompanied in their trek westward by miners. The discovery of gold at Sutter's Mill in California brought adventurous Easterners scurrying across the Plains in search of quick riches. New gold fields in western Kansas Territory (the present state of Colorado) and silver mines in Nevada, kept trails congested throughout the 1850's (Hine 1973:113).

Pioneer Settlement 1857-1868

On May 30, 1854, the Kansas-Nebraska Act divided the unorganized Nebraska territory into two separate territories. What followed was an unprecedented land grab by speculators, farmers, and railroad companies. This overnight interest in previously neglected Kansas can be attributed to four events that had direct repercussions on the settlement of Butler County: (1) the slavery controversy, (2) the scarcity of inexpensive land in the Middle West states, (3) the "free" public land in Kansas and (4) the innovations in farm machinery.

Under the guidelines of the Kansas-Nebraska Act, each territory was given the power of popular sovereignty. By leaving the decision up to a vote by Kansas citizens to determine their future as a free or slave state, rapid settlement ensued as each side, North and South, staked claims in the new territory. Colonization efforts were still in their fledgling stages when the critical issue was brought up for a vote. In March of 1855 the first territorial legislature was convened at Pawnee, Kansas. According to historian Frank W. Blackmar (1912 Vol. 1:208), the election took place in the following manner:

> Missourians in large numbers came over and voted for the pro-slavery candidates after which they returned to their homes across the river. The actual free-state settlers refused to obey the laws enacted by such a body.

Although the "Bogus Legislature" (the name assigned by free-staters) failed to commit Kansas to the Southern cause, it did fulfill one legislative duty in dividing the land east of the 97th meridian into thirty-three counties. Butler County was one of these original counties; its initial shape was a thirty-by-thirty mile square. The predominance of southern sympathizers in this territorial legislature is apparent in the naming of Butler County after Senator Andrew Pickens Butler (1796-1857), an avid pro-slavery advocate from South Carolina (Mooney 1916:35).

According to a settlement map of Kansas for 1859 prepared by Shortridge (1974:87-88), "several fingers of settlement stretched away from the [transportation hub of the Missouri River], with many outliers (an area outside a geographic boundary) and unsettled inliers (an area within a geographic boundary). The outlier farthest northwest was Ft. Larned on the Santa Fe Trail." The Butler County pioneers, who arrived in 1857, constituted the farthest point of settlement in the southwest. Westward projection of settlement, however, was principally confined to the land east of Council Grove, south from Marshall County and north from a diagonal strip extending from Morris to Allen Counties along the Neosho River. Shortridge speculated (1974:88) from this pattern of land occupation that settlement appeared to be following well-established trails and river bottoms and was delayed in areas still under Indian control.

In Butler County this pattern holds true. The Emporia Trail channeled pioneers to the banks of the Walnut River, which it paralleled. The first settlers to arrive came in the spring of 1857: Doc Lewellen, his farm now designated 14BU1005, from Iowa and Charles Jefferson, a Michigan carpenter, established claims along the Walnut (Mooney 1916:104). The well-inhabited Osage Reservation prevented them from taking claims farther south along the Walnut River. The land north of the Osage Reservation, which they settled on, was part of the New York Indian Reservation established in the 1840's. Few of the thousands of Indians for whom it was intended ever moved to it, thus permitting settlers to take claims without fear of reprisal (Baughman 1961:26). Jefferson and Lewellen sought out timbered tracts on this land for nowhere else could they acquire building and fencing material or fuel prior to the establishment of freighting lines with other towns and the coming of the railroad (Gates 1954:54). The native timber supply, though scant, was sufficient to prevent the necessity of building with sod.

The settlers coming to Kansas while it was still a territory were primarily from the Middle Western states of Illinois, Ohio, Indiana, Missouri, Pennsylvania and Iowa (Zornow 1957:174). This pattern of migration continued after 1861, when Kansas became a state, through 1890, at which time the native population exceeded the number of immigrants (Rohrer 1961:5-7). Butler County closely mirrors this migration pattern. Before 1864, the majority of settlers were from Illinois, Ohio, and Indiana (Kansas Census 1865). The division of the county into four townships in 1867 and again in 1879 permits a more precise breakdown of the project area settler's origin after these dates. The states of Ohio, Pennsylvania, Indiana, Illinois, and Iowa, in that order, provided the most citizens to fledgling Chelsea township in 1870 (United States Census 1870). In 1875, Illinois contributed the most settlers, followed by Iowa, Indiana, Missouri, and Ohio (Kansas Census 1875). From 1880 to 1890, these five states, led by Illinois, continued to render the most citizens to Chelsea township (Census 1880-1890).

Also clearly illustrated in the census records is the transitory nature of Chelsea township immigrants. The pattern of migration established, from each family member's place of birth, indicated that many, if not most, of the immigrants were following the farmer's frontier line as it progressed westward in the 19th century from the Appalachians through the Middle West to the Plains. A prime example is the John B. Shough family, residents of Chelsea township who arrived around 1870. Shough was born in Pennsylvania

and his wife in Ohio. They resided in Ohio for several years and one child was born there. The next five children were born in Illinois and the last, as of 1870, in Chelsea township (United States Census 1870).

The rise in population in the corn and hog belt states between 1830 and 1860 made available land in the Middle West scarce and increasingly expensive, and was a major factor for Middle Western farmers migrating to Kansas. Most of the land in the new territory was unsurveyed, thereby allowing the settlers to take up, improve, and have the use of the land with minimal expense. Also, innovations in farm machinery, such as John Deere's steel plow (1839), Cyrus McCormick's reapers and mowers (late 1840's), and the long-line of patent improvements that followed one another closely throughout the 19th century, provided the farmers with the technologically advanced equipment to harness their newly acquired land (Bartlett 1974:206).

The "free" land policy was changed in 1857 by President Buchanan who [when confronted with mounting deficits produced by the Panic of 1857] turned to the public lands for additional revenue (Gates 1965:46). It is unlikely that any more than a few Butler County pioneers were able to take advantage of the "free" land since the county was surveyed during the summer of 1857 and placed under the guidelines of the Pre-emption Act (United States Government Survey 1857). It was during this summer that the first group of settlers to follow Lewellen and Jefferson to Butler County (according to its 1857 boundaries) congregated at Emporia. The first to arrive there were Martin Vaught, George T. Donaldson and family, and J. C. Lambdin and his son. They were soon joined by William Woodruff and wife; James Leander; Horace, J. and L. Cole; Stephen White; Mrs. Scott and her sons, Israel, Tom, and Dave; William Rice; Mrs. DeRacken and her sons, Bob, John, and Ruben and Prince Gorum Davis Morton. Except for Morton (from Boston), the group consisted entirely of people from the Middle West states (Mooney 1916:105).

The group's decision to move specifically to the Walnut Valley, in August of 1857, was instigated by a novice explorer, I. N. Barton, who had been a college professor and civil engineer in Maine before coming west for health reasons. Martin Vaught stated in his published reminiscences that: "His description of the Walnut and Whitewater valleys and prediction that in and near them was the garden spot of Kansas won us, and we unanimously decided to go with him and see them" (Mooney 1916:104). They followed the Emporia Trail almost to the confluence of Cole and DeRacken Creeks, which they named after two of the group's families, and there set up a temporary camp.

The settlers spent the fall and early winter months staking claims in the bottoms and building log shelters for themselves and their livestock. Again quoting from Vaught:

> We went to building log cabins--homes--with a will. The three Cole brothers settled on the stream that bears their name. The DeRackens took claims on the stream to which they gave their name, now incorrectly spelled Durachen. [This change most likely resulting from the DeRacken's being accused of horse thievery and forced to leave the county]...

> it was October 1857, when I took my claim (because of the abundant timber on it) at the junction of DeRacken and the Walnut....(Mooney 1916:104).

According to the 1865 census, the first to record farm size, the claims of these pioneers averaged 160 acres. This was the maximum allotted under the Pre-emption Act, which permitted settlers to purchase 160 acres of land for $1.25 an acre. Veterans of previous wars were awarded military bounty land warrants that allowed them to purchase a quarter section at a price between 80¢ and $1 an acre (Gates 1965:44). At least one pioneer, Martin Vaught, was known to have acquired his land under this provision (Mart Arnal, personal communication). In 1862 the land in Butler County was included under the Homestead Act; thus settlers could claim 160 acres, improve on it for five years, and acquire ownership for a minimal filing fee.

Although the farmers claimed a quarter section, an average of only one-fourth of each farm was improved or fenced by 1854 (Kansas Census 1865). This may have been a result of farmers restricting their agricultural activities to that part of their claim that was bottomland, for their principal grain crop, corn, adapted well to the fertile river bottoms of the Walnut and its tributaries (Kansas Census 1865; Mooney 1916:274). This favoritism to corn production is not surprising when the origin of the settlers is taken into consideration.

The early farmers also produced wheat, rye, oats, and potatoes and grazed cattle on the open range (Kansas Census 1865). According to Butler County historian Mooney, it was from the sale of cattle that the early farmers earned their principal source of revenue. Markets were too far away (Emporia being the closest) to profitably market grain except through the agency of livestock (1916:274). Milch cows were also an integral part of the livestock component from which the average farmer in 1865 produced 128 pounds of butter and 34 pounds of cheese (Census 1865). Some of the early settlers supplemented their farm income by selling buffalo hides and wolf pelts (<u>Times</u> May 26, 1961:5).

The severe depression that struck the country in 1857 and Buchanan's change in land policy did not appear to have had immediate repercussions on the first settlers. None were known to have abandoned their claims; nor did these events deter them from continuing with their plans for building a town. In fact, during the winter of 1857-58, the Emporia group was joined by approximately 12-15 new settlers who quickly united with them in their town building activity (Mooney 1916:105).

They chose as their site for the town 160 acres between the Emporia Trail and Durachen Creek (K.H.S. Acct. No. 240, 1858), now designated 14BU1012. P. G. D. Morton, nicknamed "Pegleg" because of his wooden limb, urged that the town be called Boston or New Boston. As a loyal native of that town in Massachusetts, his inherent bias was obvious. Under pressure from his fellow townsmen he compromised on Chelsea, a town near Boston (Mooney 1916:104). On February 11, 1858, the town company was incorporated, a plat drawn up and lots presumably made available for sale (Private Laws 1858:323; Mooney 1916:105).

Chelsea's role in the internal conflicts taking place in "Bleeding Kansas" from 1855 to 1860 were negligible. The town was free-state in leaning, but being literally on the frontier, Chelsea was exempt from Border Ruffian activity and confrontation with pro-slavery settlers. Its activities consisted of holding an election in May of 1858 and voting in favor of the "Topeka" free-state constitution (Andreas 1883:1431). Also, Chelsea sent several representatives to the territorial legislatures and the first state legislature; P. G. D. Morton, 1859 and 1861; J. C. Lambdin, 1859-61 (Fisher 1930:30; Augusta Gazette, July 8, 1876).

Chelsea had an advantage from its beginning that most upstart towns envied (Boorstin 1965:161-8); it was the county seat. When the county was organized politically in 1859, Chelsea was its only town. The boundary lines placed El Dorado, a rival town that had been established in 1857, nine miles to the south, in Hunter County. While county seat, Chelsea was assured permanence and prospective growth. In light of the odds against survival (over 2,500 towns in Kansas were settled and abandoned between 1852 and 1912) it is understandable why upstart towns would grasp any title or institution that could give their town some resemblance of permanence (Boorstin 1965:93).

Like many of the towns being planned and platted across Kansas at this time and throughout the 19th century, Chelsea was the product of "men of vision who hitched their future to the sale of lots and the growth of the speculative acreage" (Bartlett 1974:423). In this case, the men who organized the town company (P. G. D. Morton, N. S. Storrs, J. Lambdin, W. Woodruff, L. M. Pratt and G. T. Donaldson) and platted the town (J. C. Lambdin) did not restrict their activities solely to being speculators or promoters; they were also farmers that recognized the benefits a successful town could provide for their dual intersts (United States Census 1860).

New towns tried to attract settlers whose presence increased land values, provided new markets for farm products, and multiplied the services available through new businesses. Also, it would be the town that would raise the bonds necessary to attract a rail line to the area. This would open new eastern markets for farm products. Improved transportation would also bring more settlers, thereby reinforcing the economic cycle for the town's development. Probably with these thoughts in mind, the pioneers set to work to change Chelsea from being just a "paper town."

The building activities in Chelsea were minimal between the years 1857 and 1867, despite its being the political focus for the country. During this time the town consisted of only six scattered buildings. Efforts for growth were apparently humbled by the country's growing depression, a drought, a grasshopper plague and the Civil War. There was a post office, a general store, and a town hall in the platted town. Other buildings and businesses that served the Chelsea community (a saw and grist mill, a Sunday school, and a school house-church-meeting cabin) were located on adjoining farmsteads.

C. S. Lambdin's log cabin did double-duty as his home and the post office. The mail for these pioneers was addressed to "Box 400" in Lawrence

and a tri-weekly hack brought it as far as Emporia. It was the duty of any Chelsea citizen visiting Emporia to bring the mail back with them (Stratford and Klintworth 1970:39).

The general store was opened in 1859 by Mr. Kaufman and probably provided household staples and many other essentials for the community (Stratford 1934:77). A stock inventory has not been located but it can be reasonably speculated that dry goods, whiskey, tools, and lumber were among the items for sale. At first all supplies had to be hauled in from Leavenworth by freight wagons drawn by cattle, oxen, or horses. Isolation was lessened when the railroad extended its track from Leavenworth to Lawrence and Topeka and finally Emporia in 1869. Track was not laid to Butler County until 1877 however, leaving the Emporia Trail as the principal thoroughfare by which supplies, mail, and travelers reached Chelsea.

Another building, Chelsea Hall, was used by the Board of County Supervisors for their annual meeting (K.H.S. Clippings Vol. 4:217). The first Board consisted of P. G. Barrett, G. T. Donaldson, and J. S. White. Among their early duties was the division of the county into three voting districts, one of which was headquartered at Doc Lewellen's house. The Board also levied the first poll tax ($1 on all male citizens between the ages of 21 and 45) and appointed the first county officers: Auditor, P. G. D. Morton; Treasurer, C. S. Lambdin; Probate Judge, J. C. Lambdin; Clerk of the District Court, Mr. Emmil; Register of Deeds, J. R. Lambdin; Sheriff, Doc Lewellen; and, county supervisor, Martin Vaught (Weekly Republican April 5, 1895; Mooney 1916:50).

The saw and grist mill, the town's first business, was built on the nearby Walnut River by C. S. Lambdin in the spring of 1859 (Mooney 1916: 106). The Sunday school, established in the summer of 1859, was conducted in an abandoned log cabin near Chelsea (Fisher 1930:13). A log cabin, originally constructed for use as a corn crib, on George Donaldson's farm just south of Chelsea, served as the first school house in Butler County, established in 1860, and as a meeting hall for the early settlers (Stratford 1934:14; Mooney 1916:338).

The first church services were conducted in the school-meeting hall-corn crib in 1858 by Rev. J. S. Saxby, accredited with also having been the first preacher in the new town of Wichita in 1868. The life of this early-day preacher in the frontier wilderness has been preserved in J. P. Stratford's book, Butler County's Eighty Years, 1855-1935:

> He was a wonderful preacher, so the pioneers said. His sermons were well put together and stirred his audiences. Often he preached in the open in the groves and often in the cabins.
>
> But some of the critical listeners who read the New York papers which published Henry Ward Beecher's sermons, declared that Saxby merely memorized the famous New York devin's messages, for they were identical, word for word. His critical prairie audience apparently did not appreciate Saxby's feat at memorizing the famous Beecher sermons, and he fell into disfavor.

Saxby could not live from the collections at his services, and often went on buffalo hunts with his parishioners ...once, when Saxby was greasing his wagon preparatory to going on a hunt, a dog slipped up and ate the tallow. It was all the grease Saxby had. He shot the dog, cut him open, extracted the tallow and applied it to his wagon (1934:17).

Saxby was just one of the revivalist preachers of the Great Awakening to find a receptive audience in this pioneer town. Rev. Isaac Winberg, a Baptist, and three itinerent preachers: Elder Rice, the presiding elder of the Emporia Methodist Church; Rev. C. C. Morse, a Congregationalist; and Father Stanbury, a Methodist minister, also brought The Message to Chelseaites in the early years (Mooney 1916:109).

As previously stated, Chelseaites were confronted by a series of disasters beyond their control during their first ten years. The 1857 depression was followed by an unprecedented drought in 1860. According to an early pioneer:

May, June, and July passed without a drop of rain. Everything green withered, even the leaves on the trees turned yellow and then brown. The streams dried up. Fish innumerable died, and as the deep water holes dried away they were pitched into a wagon and hauled to hogs. Great seams cracked in the earth. It was really dangerous to ride a pony at speed across the prairie (Mooney 1916:107).

The drought was closely followed in August, 1860 by the first grasshopper invasion to plague the pioneer settlers of Kansas. "The cloud of hoppers was so thick it literally hid the sun" (Mooney 1916:107). Unfortunately for the grasshoppers, the drought had already destroyed the crops before their arrival. As a result, they stayed just long enough to lay eggs that hatched the following spring and again caused havoc in the struggling community. In 1861, however, the farmers were able to save part of their crops.

Approximately 150 people left Butler County after the first invasion of grasshoppers, leaving the total population around 300 (Stratford and Klintworth 1970:27). Those that were not discouraged enough to leave because of these natural disasters now found their lives interrupted by the Civil War. County settlers, being on the frontier, viewed their situation as critical; surrounded by Indians on the east, south, and west sides; removed from any large towns; and too sparsely populated to defend themselves. Also, according to an early settler, J. D. Connor, during the summer and fall of 1861 they had "special reason to apprehend trouble from Texas and the Cherokee country" (Stratford and Klintworth 1970:27).

Spurred by the threat of their vulnerable condition, all able-bodied men were organized into a company for local protection during the summer of 1861. P. G. D. Morton was Captain of the company and James Craft, Lieutenant. Under Morton's supervision a fort was constructed on the bend

of the Walnut River between El Dorado and Chelsea. Fort Bend, appropriately named, had breastworks only on one side built of logs and dirt which were "not laid out with much engineering skill" (Connor, MS). The fort's other three sides were protected by the meandering Walnut. Approximately 30 to 50 men temporarily occupied this fort during the winter of 1861-62.

The only incident of war to take place on Butler County soil, for which these soldiers were called upon, was the capture of a government freight train that had been abducted by its southern-sympathizing drivers late in 1861. The train, consisting of about 30 ox-drawn wagons, belonged to the government freighting firm of Majors and Russell of Leavenworth. The settlers grew suspicious of the train, loaded with supplies for western forts, when it came in from the west and headed toward Arkansas along the California Trail. All travel in that direction was strictly prohibited at this time. The company under Morton, with the support of troops under a Captain Bemis, quickly organized and overtook the wagons at the head of Hickory Creek. Both sides were evenly matched in man power but the freighters surrendered without a fight. The prisoners were guarded that night along a branch of the Hickory. A bitter cold rain and sleet made the night uncomfortable for all involved. During the storm two prisoners escaped and the small company feared they would lead back a Confederate force, but their worries never materialized. After relocating the prisoners to Fort Bend for a few days, to rest the oxen, the company transferred them to the authorities at Fort Lincoln, Oklahoma (Stratford and Klintworth 1970:30-31). By the spring of 1862, the soldiers grew tired of the uneventful camp life on the Walnut; they disbanded and several left to join the regular army at Ft. Leavenworth. Two soldiers from Chelsea township are known to have lost their lives during the war: James Craft and Thomas B. White.

One problem the Chelsea community settlers never encountered, that many settlers on the Plains were confronted with during the 1850's and 1860's, was a conflict with the Indians. They had not settled on occupied Indian Reservation land of course, and their most consternating encounter was a mild one, recorded in Mooney's <u>History of Butler County, Kansas</u> (1916:108):

> Some buffalo hunters coming on off the plains in 1859 became frightened at what they thought to be hostile Indians. They alarmed the settlers on Whitewater and the lower Walnut. There was a great stampede to Chelsea. One of the hunters, Jerry Woodruff, mounted a pony at Towanda Springs and, with a butcher knife for a spur, made the trip to Chelsea in quick time, feeling for his scalp at every jump and warning everybody he saw. The settlers barricaded the C. S. Lambdin (log) house that stood on the then townsite not far from where J. K. Nelson's house now is. Some of the settlers declared that as they came they saw houses burning on the Whitewater. Wagons were formed into corrals with the stock inside. Water was provided in the house and every preparation made to stand off the noble Red Man. Pickets were posted by Capt. George T. Donaldson, who commanded, among them 'Pegleg' Morton. Along toward morning, when Indians usually made attacks, he heard the whizz [sic] of arrows coming

from the river. In a panic he fired his gun and consternation reigned. Children cried; mothers prayed; men swore and prepared to sell their lives dearly. The redskins didn't advance at once and cool men said we'll reconnoiter. They advanced with Morton to his picket post when whizz! whizz! went the arrows. 'That's them' said Morton, 'they're shooting at us!' But the sounds were nothing more nor less than goshawks gathering their food as they flew. Morton never heard the last of his scare. The Indians didn't come, and those of the settlers who quit running at Chelsea (some didn't, continuing on to 'the States') returned to their claims. The alarm was due to the passing of Indians from the southwest to fight with the Kaws near Council Grove. The false character of the scare was not discovered until P. B. Plumb, at the head of a small company from Emporia, came down to help repel the Indians.

During the Civil War years, several bands of Indians camped peacefully along the banks of the Walnut. The Cherokees came in 1862, having been forced from their reservation by Confederate soldiers. The Kickapoos, Shawnees, and Delawares arrived the following year, on route to their new reservation in Indian territory (Mooney 1916:67). Some families of Cherokees and Kickapoos remained on the Walnut for several years but by 1867 all the Indians had willingly moved or been forced out of Butler County. In that year the county received its final boundary revisions. The Osage Reservation land, that comprised the southern half of the new county, had been opened as pre-emption land two years earlier and was quickly being claimed by settlers.

Expansion Period 1867 - ca. 1900

Traditional post-war mobility, renewed railroad construction, and increased rainfall brought about a second peak migration period to Kansas in the late 1860's and early 1870's. In addition to these catalysts, prospective settlers were being actively recruited by land agents, railroad companies, and indirectly by the federal government through the 1880's. Propagandist literature, published or endorsed by these booster groups inundated the United States and Western Europe (Emmons 1971:73-127). The government added tangible incentives with the Homestead Act (1862), the Timber Culture Act (1873), and the Desert Land Act (1877). The motives for these activities were principally economic: settlement meant increased markets, land sales and a new source of federal revenue. Railroad entreprenuer J. J. Hill best summarized their shared interests in his statement, "You might put a railroad in the Garden of Eden and if there was nobody but Adam and Eve, it would be a failure" (Emmons 1971:37):

The success of their combined efforts is evident in the following population chart for Kansas, Butler County, and Chelsea township.

	Kansas	Butler County	Chelsea Township
1865	ca. 100,000	294	NA
1870	364,399	3,035	277
1880	996,096	18,586	340
1890	1,428,108	27,018	512

As stated earlier, the vast majority of settlers to this area throughout the 19th century were from the Middle West States. Butler county only contained about 5 percent European immigrants, primarily from Germany, England and the Scandinavian countries (State Board of Agriculture Report 1875:70), the countries that sent the largest number of immigrants to Kansas generally. The percentage of foreign immigrants to Chelsea township, however, was negligible.

Increased population brought several changes in the agricultural activities of the settlers. Following the Civil War, land in the bottoms was quickly claimed, forcing the later settlers to take claims in the thinner uplands. According to an early settler, this was combined with the depletion of the valley's fertility, exhausted by the early farmer's use of the "one crop plan," and there arose a need for new suitable crops (Stratford and Klintworth 1970:91). Sweet sorghum was the first crop introduced in the late 1860's or early 1870's, and provided a valuable forage crop for livestock. The farmers also capitalized on sweet sorghum by milling it into molasses that was used locally and exported (Mooney 1916:265). Alfalfa and kafir corn were introduced in the 1880's and 1890's. They met the farmer's need for a soil restorer and a grain crop, respectively. Corn, however, remained as the principal grain crop throughout the 19th century with wheat production a close second. An example of the increased productivity of corn in Butler County is a comparison of the county's annual production to the state's: Butler County was ranked 17th out of 70 counties in 1874, six years later it was sixth (State Board of Agriculture Report 1881:140). Kafir corn (in its hybridized forms known as milo or grain sorgum) superceded corn in the early years of the 20th century as the major grain crop produced in in the county (Mooney 1916:266).

After the Civil War, the cattle business continued as a major agricultural activity for Butler County settlers. This can be attributed to settlement of the uplands which occurred simultaneously with a post-war beef shortage in the East, making cattle raising a lucrative business. The bluestem prairie grass that covered the eastern half of the county was ideally suited for grazing cattle (Malin 1942:3-8). Butler Countians also had the advantage of acquiring Texas cattle which were being driven north at this time along the proximal Chisholm Trail to the railheads at Wichita and Abilene. Longhorns were being sold in the county be 1872 (Mooney 1916:273). Although splenic or "Texas" fever devastated many domestic herds in Kansas, there was never a recorded outbreak of the disease in Butler County. By 1873 the county had a total of 8,978 head of cattle, an increase of over 3,000 head from 1870 (State Board of Agriculture Report 1875:138).

The Herd law, passed in 1872, closed the open range and forced cattle raisers to purchase and fence their grazing land (Dykstra 1968:40). According to the State Board of Agriculture Report for 1875, all the land in Chelsea township was in the hands of private owners by this year. This would indicate a specific interest in cattle raising, especially among upland settlers, since bottomland was still available from railroads and the government in other parts of the county. Also, by 1881, Chelsea township ranked fourth out of the twenty-nine townships in cattle production (<u>Times</u> June 10, 1881).

The oversurplus of beef in the Eastern market and the blizzard winter of 1886 on the Plains brought an end to the Kansas cattle boom that had reached its peak in 1884 (Malin 1942:13). Butler County, and specifically Chelsea township, however, continued to be a major cattle producer with county herds totaling a record 38,996 head in 1890 (State Board of Agriculture Report 1891:21). Texas Longhorns were phased out by this time and finer breeds, such as Ayrshires, Brown Swiss, Red Pollard, Jerseys, Holsteins, and Herefords were being raised on specialized stock farms (Mooney 1916:274). Stock raising remained the leading industry for the county through the 19th century.

The success of farming activities and stock raising in Chelsea township by the mid-1880's is apparent in the following statistics. In 1886 the total population of the township was around 500. In comparison with the other twenty-nine townships, it ranked twenty-fifth. However, in taxable valuation the township was surpassed by only seven others (Murdock 1887:14). The low number of inhabitants but high taxable valuation indicates a relatively prosperous farm community possibly as a result of upland farmers engaging in cattle raising instead of solely raising grain crops.

The town of Chelsea would not have noticeably affected these statistics since it was technically defunct by this time. The decline of Chelsea began shortly after it lost an 1870 county seat election to El Dorado. The continued success of this neighboring town to attract more citizens and businesses during the 1870's and 1880's and its position as the terminus for the first railroad to Butler County (a branch line of the Atchison, Topeka and Santa Fe in 1877) sealed Chelsea's fate (Stratford and Klintworth 1870:84).

The demise of Chelsea, however, is more typical of pioneer towns in Kansas than those which persisted like El Dorado. According to Baughman (1961:iii), there had been a total of 4,281 post offices established in Kansas since 1854. It would be reasonable to assume that this would reflect the establishment of the same number of towns. Boorstin reported over 2,500 towns perished between 1852 and 1912. Baughman noted that 3,504 post offices were discontinued in Kansas before 1961. Thus well over half the towns established in Kansas were not successful. The complete life cycle for the town of Chelsea took only twenty years.

Until 1864, Chelsea consisted of six log buildings with a community population estimated around 75 citizens, living on scattered outlying farms and was the unrivaled county seat. In that year a suggestion was made to the Board of County Supervisors to build a court house to hold the county offices. This suggestion was most likely proposed by the citizens of El Dorado who viewed it as their chance to bring the county seat question up to vote (the 1860 boundary lines placed El Dorado in Butler County). On May 21, 1864, the election was held and El Dorado proclaimed the victor. Chelseaites, however, were not about to let the title slip through their hands. The following entry in the commissioner's journal, made on July 4, 1864, illustrates their ingenuity at finding a reason to temporarily remain acting county seat:

> Resolved that whereas the county seat has been removed to El Dorado and there is not any building there which can be

> procured for county offices, such offices will not remove until such buildings can be procured. Signed Martin Vaught, county clerk (Butler County Clippings Vol. 4, 1951-58:218).

The steady influx of settlers to Butler County after the war channeled new growth to the fledgling towns of Chelsea and El Dorado. The latter in particular reaped the benefits of this increased migration as a result of its prime location at the crossroads of the Osage, California , and Emporia Trails. In 1867, the prestigious county title was again brought up to a vote. El Dorado easily won the election, receiving 50 votes as opposed to Chelsea's 29 and acquired the full duties and privileges of the office, having provided a suitable court house by this time (Weekly Republican April 5, 1895).

It can be reasonably assumed that the Chelsea citizens were not satisfied with the outcome of this election and sought to regain the title by their ensuing actions. Taking a cue from El Dorado, they moved Chelsea (14BU1007) closer to the Emporia Trail, which had been commissioned as the first county road in 1861, thereby making their town more visible to passing travelers (Mooney 1916:51). A new town company was organized (E. Bishop, J. M. Rayburn, J. B. Shough, J. E. Buchanan, J. B. Persons, O. E. Saddler and M. Vaught) and a plat drawn up (T. R. Wilson) (Fig. 9.1) (K.H.S. Corporation Book Vol. 2:629; Butler County Plat Book A). Although these documents are dated November 1, 1870 and April 27, 1870 respectively, other evidence suggests that the actual move occurred two years earlier. It was in 1868 that the post office was moved from Lambdin's cabin to George Donaldson's house (K.H.S. Vol. 12, 1911-1912: 472-3). Also, Donaldson, who was killed in 1869 while hauling logs, was instrumental in supporting the town in its new location that bordered his farm. He had been the owner of approximately twenty-one town blocks, indicating that the town was at least roughly platted before that time (Deed Book D:114).

Between 1868 and 1870 the town rapidly increased both in size and population in its new location. El Dorado's newspaper, the Walnut Valley Times, which began publication in 1870, relates the following accounts of the growth of Chelsea:

> March 4, 1870: This beautiful town is situated on the Walnut, about nine miles north of El Dorado. It was laid out a year ago. There are eleven houses on the town site. A new school house, 26' X 38', one story high, of pine lumber has been put up this winter and will be ready for occupancy in a short time. Saddler and Becker are engaged in the merchandise business. Mr. Beal is putting up a new house and will go into business soon. J. B. Shough owns and runs a hotel. The building is a two-story frame and of sufficient dimensions to accomodate the traveling public. We understand that Mr. Shough is making arrangements to start a county seat there soon. Arrangements are being made for a good saw and grist mill to be put up there at an early day. Chelsea is an enterprising town.

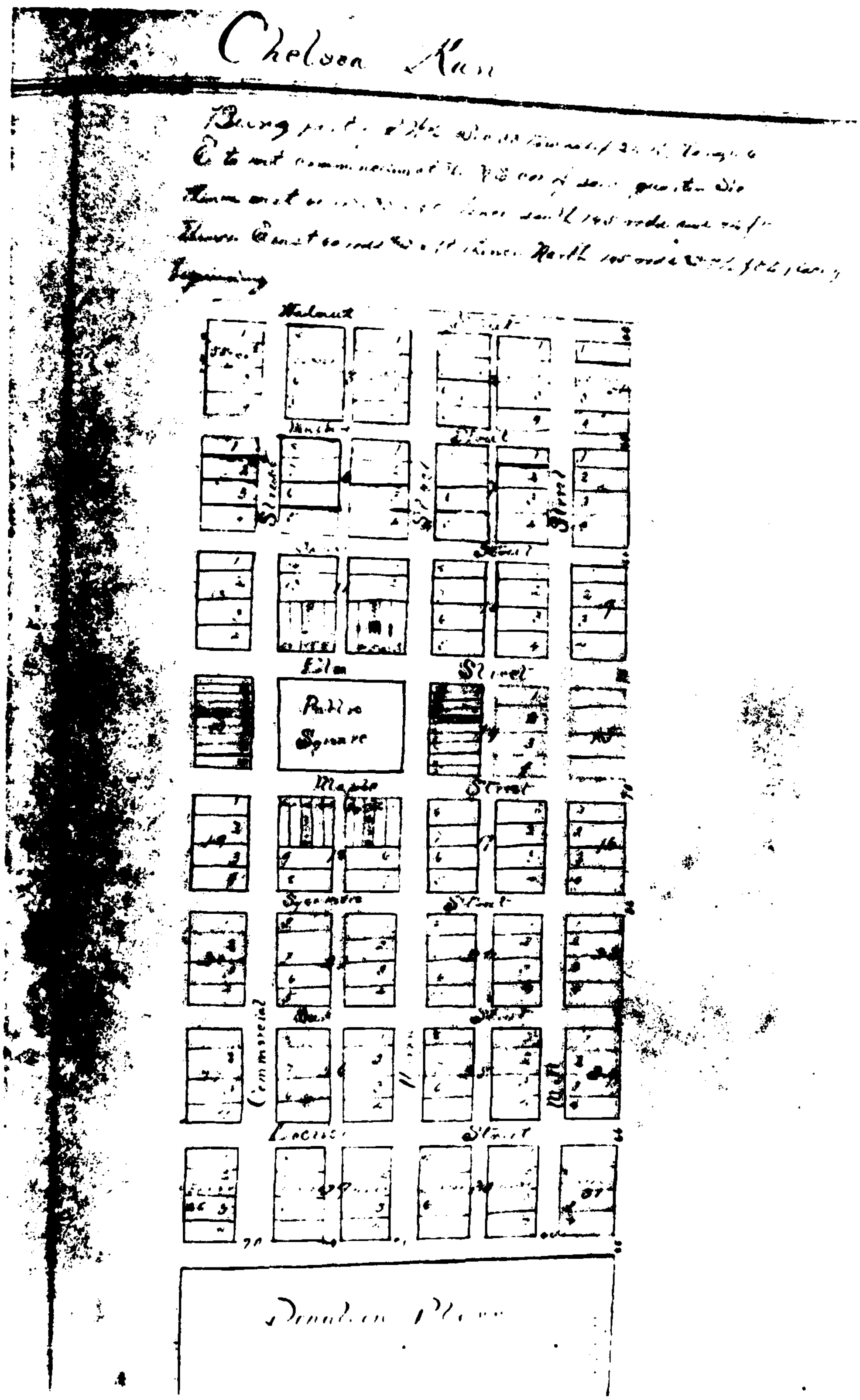

Figure 9.1. Original plat of the relocated town of Chelsea, Kansas.

March 11, 1870: The people of Chelsea gather socially every week. Last Thursday (the gathering was) held at Deacon John M. Rayburn's house. Music by Mrs. Stinson. Small admission fee (is) used to buy lamps for and otherwise fit up the new school house, which will also be used as a place of worship--it is nearly completed; built by Bishop and Gordon it has the first bell in the county.... People are still hoping the county seat will be moved back to Chelsea from El Dorado, but it became an evident failure at the demise of the lamented Donaldson.

April 1, 1870: Mr. George Beal, from Xenia, Ohio, has just erected a store room 20' x 40' in Chelsea which he will immediately fill with a general stock of merchandise. Part of his stock is already on the ground. There are now twelve or fifteen new buildings going up. A drug store is soon to be put in.

April 29, 1870: Mr. Hess, the 'Highpopalorem' of the Chelsea Town Company, says that Chelsea will vote enough bonds to induce the Sedalia, Ft. Scott and San Francisco railroad to run from Eureka to the head of Fall River and make Chelsea the first point in Butler County.

May 6, 1870: Chelsea, our neighbor up the river, has grown somewhat since we were there last. The new school house is completed in a substantial manner and is an ornament to the town. Several new houses have been put up lately. The hotel has been remodeled and improved. J. W. Beal's new business house is completed and ready for goods. They need and should have immediately a good saw mill. We hope they may be able to get one soon.

Also in 1870, Chelsea acquired a shoe shop operated by A. M. Farnum, a drug store owned by Dr. Zimmerman, a blacksmith shop operated by John Houser, and another general store owned by James McQuarter and managed by Rollin Lakin (Mooney 1916:566-7). J. S. McWhorter, Henry Bell, and J.K. Skinner built a saw mill and shingle machine in that year and Smith and Bishop were engaged in selling goods "both wet and dry" in the town (Mooney 1916:110, 318). In the summer of 1870, the Emporia based Parker and Tisdale Company established a daily stage coach line from Emporia to Wichita via the Emporia Trail. Chelsea was one of its way-stations for changing horses and delivering mail and passengers (Stratford 1934:16). A cemetery, approximately one-half mile northeast of the town, was also established around this time (Mooney 1916:337). New Chelsea, by 1870, had an estimated population of 200.

New Chelsea was not the only town in Butler County experiencing a period of rapid growth around 1869. El Dorado's population had increased to 400 inhabitants by 1870. El Dorado, however, had two vehicles to promote its success which Chelsea failed to acquire. In 1869, three El Dorado town boosters, two of whom were real estate agents, published "The Guide," a promotional handbook describing El Dorado and Butler County (Mooney 1916:121).

On March 4, 1870, the town began publication of a newspaper. If the Walnut Valley Times was like most western newspapers, and there is no reason to doubt that it was not, it had an Eastern reading audience as well. The paper would have been sent by town residents who hoped to persuade their friends and relatives to join them in Butler County and specifically El Dorado.

In May 1870, the last county seat election in which Chelsea was involved was held. The effects of El Dorado's unprecedented growth over Chelsea and the five other towns competing for the title inevitably resulted in its retention of the county seat; El Dorado polled 311 votes to Chelsea's 77 (Weekly Republican April 5, 1895). For three to four years following the election the Chelsea Town Company, under the auspices of J. W. Hess, continued to sell lots and the town even acquired two new businesses. A saloon was opened by Frost and Smith in 1874 and J. W. Dugan built a water powered grist mill near new Chelsea (Mooney 1916:567). In that year, however, the town only had a population of 150 citizens and was ranked fifth, or last, in size among Butler County towns (State Board of Agriculture Reports 1874:122). Compared to first ranked El Dorado, incorporated in 1871 as a third class town on the basis of population, with a population close to 1,100 citizens by 1875, the town of Chelsea was beginning to fail. According to Mrs. J. E. Buchanan's published reminiscences (Mooney 1916:339) the decline of Chelsea occurred as follows:

> Slowly but surely began the process of disintegration. J. B. Shough, proprietor of the hotel, sold out and moved to Kansas City. Dr. Zimmerman, druggist, went back to Cincinnati. J. M. and M. C. Rayburn, with their families, also went to Kansas City.... The saw mill vanished. Dwelling houses were moved out onto surrounding farms. The church, denuded of most of its members, languished, and the town site gradually lapsed into a corn field.

The town did not completely disappear quite as rapidly as Mrs. Buchanan stated, although after 1874 Chelsea was never again recorded in the list of Butler County towns. From a personal letter written by a Chelsea citizen, J. M. Sarrison, to a patent medicine company in Topeka, the town in 1890 was "small, just a country post office" (Knaus-Gavitt MS). The post office remained at Chelsea until 1907 (Baughman 1961:24) and the school, which Sarrison failed to mention, continued to operate until 1953 (Lucas 1973:6). A Methodist-Episcopal Church was built in 1902 and was in use until 1963. According to local informants, a general store was also in operation around the turn of the century as well as a blacksmith shop (H. Milbourn; Mary James, personal communications). A few small residences were still occupied in the town at this time and a telephone exchange was opened in one of them by the Central Union Telephone Company around 1910 (Mooney 1916:203). Only the Chelsea Cemetery has remained permanently intact to the present time to mark the location of what was once the promising town of Chelsea.

Two attempts were made by railroad companies to re-establish a town of Chelsea in the 20th century. The first attempt was made by the Kansas City, Mexican-Orient railroad in 1903. Chelsea was platted as a shipping terminus

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PREHISTORY AND HISTORY OF THE EL DORADO LAKE AREA, KANSAS. PHAS--ETC(U)

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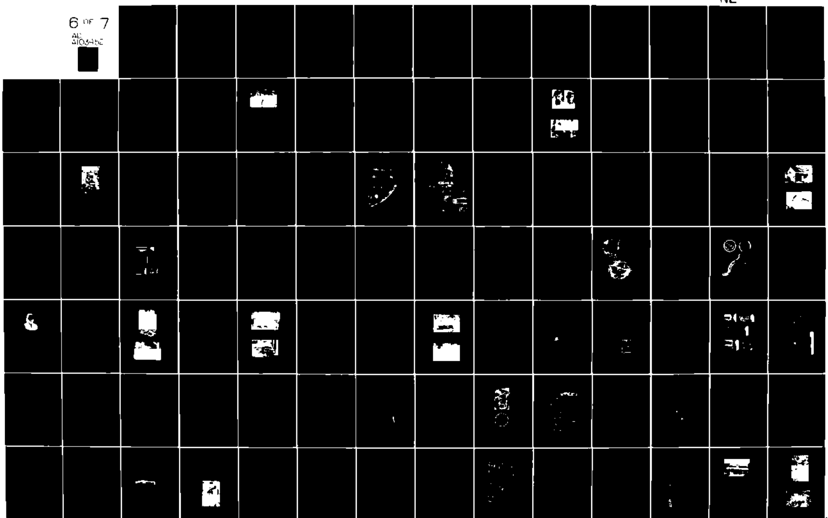

for the railroad but the company went bankrupt before any track was laid. In 1923 the Atchison, Topeka and Santa Fe built a second branch line to El Dorado and established a town of South Chelsea along its tracks, using the Kansas City, Mexican-Orient plat (Stratford 1934:141-142) (Fig. 9.2). The town never grew beyond a shipping station for grain and cattle to Kansas City and a watering stop for cattle being shipped from other points along the track, however. South Chelsea, a town of four to five houses, was only in operation for seventeen years; slaughtering houses in El Dorado and refrigerated box cars and trucks rendered it obsolete.

Summary

The history of the El Dorado Lake area during the pre-settlement era; the pioneer period, 1857-1867; and the expansion period, 1868-ca. 1900, has closely paralleled many events in Kansas history. For this reason the area has proven to be a reliable model of the Kansas settlement experience. This experience typically involved small groups of settlers, primarily from the Middle West states, moving into Kansas after 1854. These settlers took claims along well-established trails and river bottoms and on unoccupied Indian land. In their new location they established towns to provide a focus for their settlement. The Civil War stalled settlement and building activities for four to five years but from 1865 through 1890, immigration increased at an unprecedented rate. During this time farm settlers learned to adapt to and better exploit their new environment with the aid of technologically improved farm machinery, new crops, and by raising cattle.

Particular attention in this report has been given to the frontier towns of Chelsea and New Chelsea since they were the area's principal historic features. As a result of tracing their history from the organization of the town company through ca. 1900, the life cycle of what can be considered a typical frontier town has been established. This pattern of town development was established for the thousands of Kansas towns planned and platted in the 19th century. These towns were the product of local residents, outside land speculators or railroad companies, who were usually motivated by economic reasons. In all cases, increased settlement was mandatory if the town was to prosper, therefore, attraction of new settlers was a principal objective. A good location; for example, near a major trail; active promotion through advertising; the county seat title or a rail terminus enhanced town growth. Those towns which were successful in procuring these characteristic traits, and accompanying growth, quickly overshadowed those which did not. In the case of Chelsea, New Chelsea, and South Chelsea, the demise of these towns can be directly attributed to the ability of their neighboring town, El Dorado, to meet these criterion for a successful frontier town.

Recommendations for Future Work

Although the history of the El Dorado Lake area has been described and analyzed to some extent, gaps still remain. For this reason, it is suggested that a historian investigate the following areas during the 1979 field season:

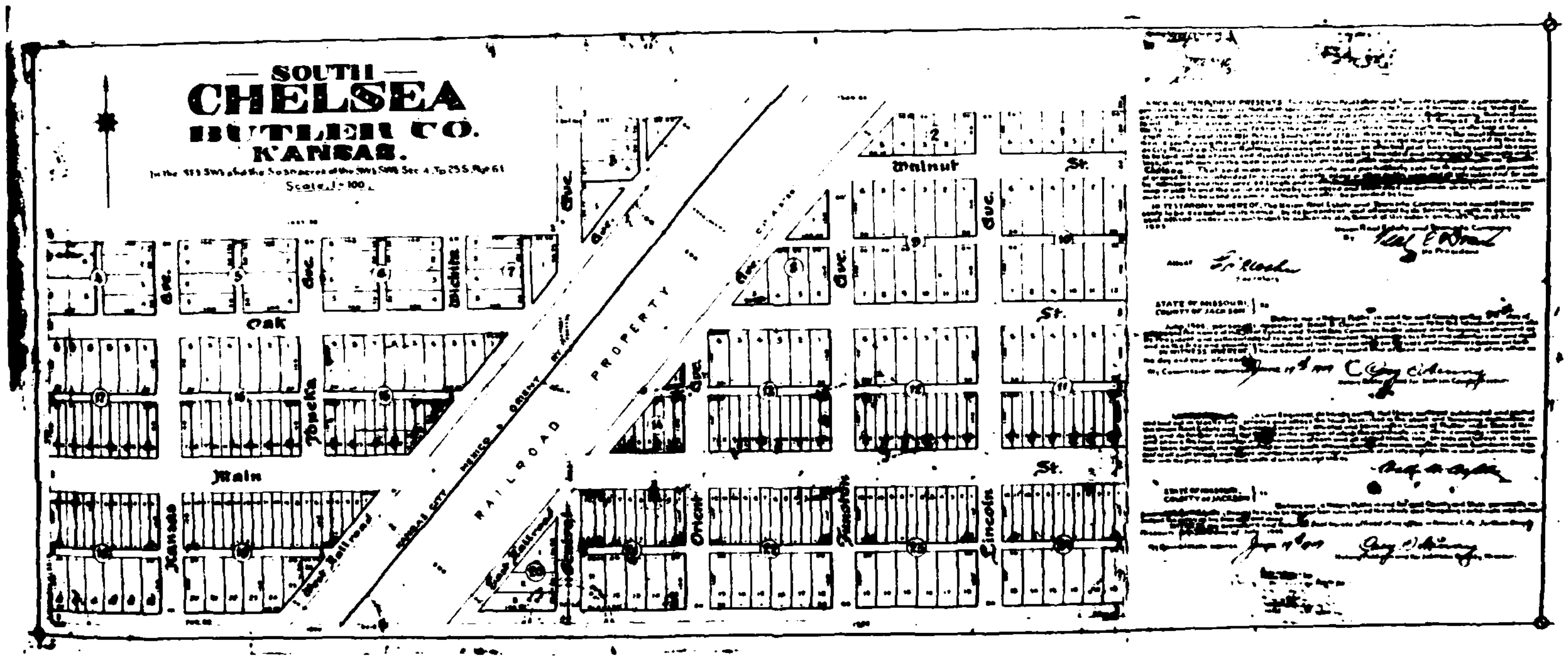

Figure 9.2. Plat of South Chelsea, Kansas.

(1) Further documentation of the buildings in Chelsea, New Chelsea and South Chelsea should be continued to precisely locate their construction sites for archaeological excavation. Also, this data would be useful to the historian in examining the social organization of the town through the type, construction and placement of the buildings, specifically in New Chelsea where there was considerable building activity.

(2) Further documentation on the location of primary and secondary occupational dwellings is also suggested. This data would be used to distinguish settlement and growth patterns, some of which have been hypothesized from the sites recorded during the summer of 1978. In addition to location of building sites, type, style and construction material should also be recorded when documentation is available.

As already established in this report and the site survey forms, housing is a tool for ascertaining from where settlers came. Housing can also reflect economic changes in the community. For example, the transition from log cabins to frame houses might indicate the presence of a saw mill or increased trading with other towns; it would also suggest some degree of economic prosperity for the individual farmer.

The necessary information for establishing building patterns, change in construction material and style would most likely be attainable from personal interviews with local residents, specifically descendents of the original owner. The photographic archives of the Butler County Historical Society and the Kansas State Historical Society, as well as the private photographic collections of local residents, may yield the desired information.

(3) Although it has already been established that cattle raising became the principle agricultural activity in the Lake area by the end of the 19th century, the repercussions of this activity on farm size have not been adequately dealt with. It can be suggested from the national trend that in the 20th century farms in Butler County increased in size and tended to specialize. Further documentation, however, is necessary to substantiate this hypothesis, ascertain when this change occurred, and the social and economic repercussions it had on farmers.

(4) It has already been established in this report that the growth of El Dorado was a major factor in the failure of New Chelsea and South Chelsea. However, the relationship of Chelsea's farm community to the town of El Dorado has not been explored. The principle yet unanswered question is: How did the loss of the town affect the social organization of the farm community?

(5) In general, the early decades of the 20th century have only been briefly dealth with and then primarily in terms of the establishment of South Chelsea. Further investigation of this town and its relationship to the farm community, which definitely monopolized this area, is recommended. Also, how periods of drought and national recessions or depressions affected this area should be more thoroughly examined for the latter decades of the 19th century up to 1928.

(6) The unique construction of George T. Donaldson stone cabin (14BU1008) merits preservation. Due to the double stone wall-rubble fill construction, that makes it virtually impossible to move, the structure is not recommended for inclusion in the El Dorado Historic Sites Park. However, for assuring the preservation of the historical and architectural significance of this building as part of any mitigation plan, the Historic American Buildings Survey (HABS), that administers a national program for recording historic buildings, should be consulted.

Acknowledgements

A special thanks must be given to many informants who helped in compiling the local history: Mart Arnall, Mary Buchanan, Mary James, Madge Jones, Kathleen Parsons Kunkle, David Nuttle, Olin Stansbury, William Sturbenz, Helen Teter Zebold, and Charles Teter, El Dorado residents; Willian Carl Paulson, Wichita resident; John Egan, Towanda resident; Benny Banks, Lee Foster, and Craig Kobel, Prospect Township residents; John Hogoboom, El Dorado Township resident; James Holderman, Joseph Lewellen, Glen, Fern, and Freena Lucas, Wayne Manka, and Homer Milbourn, Chelsea Township residents; and Leo Hulleham, Pasadena California resident and geneaologist of the Lewellen family. Madge Jones and the Butler County Historical Society provided much appreciated assistance. The staffs of the Register of Deeds and County Clerk's offices at the Butler County Courthouse were most cooperative in our research. Dr. James Shortridge of the Department of Geography, University of Kansas, provided valuable advice.

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CHAPTER 10

AN INTRODUCTION TO HISTORIC SITES ARCHAEOLOGY IN THE EL DORADO LAKE AREA

Ricky L. Roberts

Abstract

During the summer of 1978 the University of Kansas Museum of Anthropology initiated a large scale investigation into the historic period of the El Dorado Lake area. The historic period begins in 1857 with the arrival of Anglo-American settlers. Using documentary sources, informants, and field surveys, 66 historic sites greater than 50 years in age were recorded. Each was evaluated for historical, architectural, and/or archaeological significance. Six of the sites were test excavated. Data accumulated indicate a settlement pattern change from lowlands to highlands concurrent with a shift from wood to stone building. Evidence also suggests settlers were parsimonious in the use of their resources and maintained economic relationships with their places of origin.

Introduction

Archaeological research directed specifically at the historical resources within the El Dorado lake area was initiated in the summer of 1978. This work adds a new dimension to the previous ten years of archaeological research in the area. For the first time a formalized approach to the identification and evaluation of historic resources was used. The results are a significant new body of data related to man's adaptations to the environment and the salvaging of a sizable portion of the local history.

Previous Work

Prior to 1977, the National Park Service and the Butler County Historical Society funded a number of years of archaeological survey and salvage within the El Dorado Lake area. Almost without exception, this work was directed towards the prehistoric archaeological resources. Only one historic site in the lake area, 14BU38, was recorded (Bastian 1978:62). In addition to this, the Historical Society funded the excavation of an historic log cabin site near the lake area (Bradley n.d.). No professional attention had been given the architectural features of the area.

Since 1977, the Tulsa District of the U.S. Army Corps of Engineers has supported all archaeological research in the lake area. Leaf (1976:12-4) pointed out the deficiencies in the treatment of the historic and architectural resources when he proposed the research design under which current archaeological investigations are being conducted. The Museum of Anthropology at the University of Kansas developed and implemented a formal approach to the study of the El Dorado Lake historic sites. This project is the fruition of that effort.

The Nature of Historic Sites Archaeology in the Lake Area

Historic sites archaeology in the El Dorado Lake area conforms well with Schuyler's (1970:84) definition, "the study of the material manifestation of European culture into the non-European world starting in the 15th Century and ending with industrialization or the present, depending on local conditions." All of the historic sites that have been identified within the boundaries of the lake are 19th Century Euro-American sites.

The lack of historic or protohistoric Native American sites along the Walnut River and its tributaries cannot be explained at this time. As was noted in Chapter 9, the area was used as a hunting ground by several groups, notably the Wichita and Osage. Although there are no known accounts of long-term horticultural occupations by Native Americans during the historic period, short-term hunting camps were used. Yet, no sites recorded have trade goods in their assemblage. The latest Native American site is 14BU71, a Middle Ceramic site with a radiocarbon date of A. D. 1267±90 (Fulmer 1977:57). This means a 600 year gap exists in the archaeological record between the last known Native American occupation and the beginning of permanent Euro-American settlement in 1857. The reason why the gap exists may be learned by examining late sites such as 14BU71.

Investigation of sites dating within the latter half of the 19th Century is increasingly referred to as Victorian archaeology (Brose 1967 and Baker 1978). Although the lake area sites do fall within the temporal range of the Victorian period, ca. 1850-1900, the connotations of the term, "Victorian," are not compatible with the reality of the archaeology. Victorian is a term best used in Eastern urban areas where there are definable changes in architecture and society as the impact of industrialization was being felt. The area under consideration here was a frontier during the Victorian decades. It was removed from the mainstream of American society. In this sense, the sites within the lake area are no more Victorian than sites on the 18th Century frontier are Georgian. In fact, sites from these two diffuse frontiers would have more in common with each other than they would with their contemporary urban centers.

The historical archaeology that has been conducted in the El Dorado Lake area can be looked upon as a form of ethnoarchaeology. Gould (1971:175) proposed three levels at which ethnoarchaeology can operate and these were refined by White (1977:101-2). Research was conducted at all three levels in this project.

On the first level, Gould's "practical level," the ethnoarchaeological approach was used when informants were called upon to locate and identify historic sites. Level two, Gould's "specific interpretation level," involved the observation and questioning of informants about various aspects of their material culture, primarily site function and architecture. The third level, Gould's "general interpretation level," was the reconstruction of the area's history and concommitant social changes. It must be noted that ethnoarchaeology must be performed prior to the fact; i.e., the ethnoarchaeological investigation must take place before excavation. Questioning informants about the results of archaeological research is better considered a sophisticated ethnographic analogy, rather than ethnoarchaeology (White 1977:101).

The Lake Area As a Frontier

The exploration and settlement of the greater part of the continental United States began in the late 18th Century and was nearly complete by the end of the 19th Century (Bartlett 1974:447). Within this time period the Great Plains, of which the impact area can be considered a border, were among the last areas settled. The reasons behind the delay in settlement need not be discussed here but it is important to note that they resulted in the Great Plains becoming one of the last great American frontiers.

As the control of a state expands over new territory, the area of dispersed settlement between the settled and unsettled parts of the territory is called the frontier (Kristoff 1959:274 and Weigert et al. 1957:115). At the time of its settlement, the reservoir area was the westernmost occupation in Kansas (Shortridge 1974). It was between the unsettled Flint Hills and the remainder of settled eastern Kansas and Missouri. By definition the frontier came into existence when the first permanent settlers arrived and ceased to exist when stabilization of the settlement pattern was achieved (Hudson 1969:367). A third consideration proposed for defining the end of a frontier, reaching an upper limit of growth, is a vague idea difficult to translate into measurable variables and thus, not used here. The frontier period for the impact area, therefore, can be placed within the following time frame: 1857 (arrival of the first group of settlers) to ca. 1870 (the demise of the original frontier town of Chelsea).

The most common type of site that characterizes this frontier is the same as that of the "second American frontier" from which many of the original settlers came: nuclear family farmsteads (Arensberg and Kimball 1965:108-12). As such, this is a farmer frontier comprised of permanent settlements of single family dwellings on relatively large tracts of land (Thompson 1973:11).

Lewis (1977:154-5) proposed five conditions which characterize a frontier:

> First, prolonged contact must be continually maintained between the colonists and their parent society. Second, as a result of its relative isolation and the attenuation of trade and communications linkages with the homeland the intrusive culture exhibits a sudden loss of complexity. Third, the settlement pattern in the area of colonization becomes more geographically dispersed than that of the homeland unless temporarily impeded by restrictive conditions. Fourth, the dispersed settlement pattern within the area of colonization is focused around central settlements called frontier towns....[Fifth], as the colony changes through time it also varies geographically.

The settlement of the El Dorado Lake area conforms with the above specifications. 1) Settlers were in constant contact with their parent society, the East. There was a flow of goods between the two and Eastern social upheavals such as the War Between the States had repercussions that were felt on the frontier. 2) The occupation in the lake area was less

complex than eastern Victorian society. 3) The first settlements were well dispersed along the Walnut River Valley. 4) One of the first actions taken by the original settlers was to establish a town which became a center for activities: county seat, school, church, and post office. 5) Through time, settlement patterns changed and population densities increased.

Historical Significance

The area impacted by the lake is of unquestionable importance in local history. Contained within the lake's borders are the original county seat and frontier town, 14BU1012; the relocated frontier town, 14BU1007; and some of the first farm settlements, 14BU1004, 14BU1005, and 14BU1008, to name a few. The lake is, in short, flooding the heart of Butler County's history. As a result, the Butler County Historical Society is taking as active a role as possible in preserving much of the local history that is being adversely affected by the lake. In this project the Museum of Anthropology cooperated with the Historical Society in securing and utilizing data. Much of what was done and learned by the historic sites crew not only fulfills the Corps of Engineers' obligations to identify and preserve cultural resources but also contributes to the Historical Society's efforts.

As a frontier model, this area transcends local importance. The history of this particular part of Butler County is illustrative of the history of Kansas and this geographic region. The adaptions to a new environment; the progressive settlement of the area; the rise and fall of the frontier towns; all of which are representative of the settling of the Central Plains in general and Kansas in particular. Through the historic sites archaeology project not only will the history of the area be preserved, but the first steps towards the scientific understanding of the Great Plains frontier will be taken.

Research Design

As Baker (1978) noted in his survey of Victorian period archaeology, few but military sites from that era have been investigated within the State of Kansas. There are no archaeological reports available in the literature that deal with farmsteads or frontier towns in Kansas. The research design for this project was developed specifically to rectify this situation.

The primary concerns of the historic sites crew during the summer of 1978 were two-fold: 1) identify historic period sites in the impact area; and 2) test excavate a representative sample of those sites. Within this framework, the intention was to recover data that would be useful in developing an understanding of the adaptations the settlers made to their environment, the economic networks that were operating, and the social system that existed. The long range goal is to develop a quantified frontier "pattern" (cf. South 1977:31-46) that could be compared with other frontier "patterns".

Historic Site Identification

Because of personnel, financial, and time limitations, a pedestrian survey of the impact area for historic sites was impossible. Instead, the researchers made full use of informants (practical level ethnoarchaeology) and documentary sources such as maps, atlases, histories, and land records. Since the time period being considered is so recent, these resources were sufficient to locate and identify most of the sites (Fig. 10.1).

The first step in identifying potential historic sites was taken by the historical archaeologist and the project historian prior to the field season. Informants were found and questioned about all buildings and structures within the boundaries of the lake that were visible on 7½" USGS quadrangle maps. Next, the quadrangle maps were compared with two early atlases of Butler County (McGinnis and Thomas 1885 and Standard Atlas 1905), corresponding and missing buildings and structures were noted, and informants were again consulted. The final step in the process was to record those sites that were reported by the informants but were not present on any of the maps. As each site was recorded, it was assigned a unique number to identify it. The number consisted of an "H", meaning it was an historic site; a "78", which was the year it was identified; and a final number that was the site's position in the identification sequence (1, 2, 3, 4, etc.).

Once a site was recorded, other documentary sources were consulted to develop a more complete picture of the occupation. Each recorded site was individually field checked not only to verify its existence but to determine its condition. This process of site identification and verification was continuous and was the primary responsibility of the historian throughout the summer.

In the use of documentary data to locate historic sites, the historian was confronted with one of the common problems of American frontier research - very few records exist. For example, land records contain only the data related to transfer of ownership; there is no mention of improvements such as houses, etc. Other types of documentary data such as probate records, inventories, etc. which are used extensively by historical archaeologists in the east to both locate and describe historic sites (cf. Deetz 1977 and Bowen 1978) do not exist for Butler County's historic period.

Test Excavations of Historic Sites

Six historic period sites were test excavated during the summer of 1978. A crew of two, under the direction of the historical archaeologist carried out the testing. The data recovered by these excavations both supplemented and elaborated upon the documentary record. These data illustrate the importance of the historical archaeological record in the El Dorado Lake area and provide the basis for mitigation proposals.

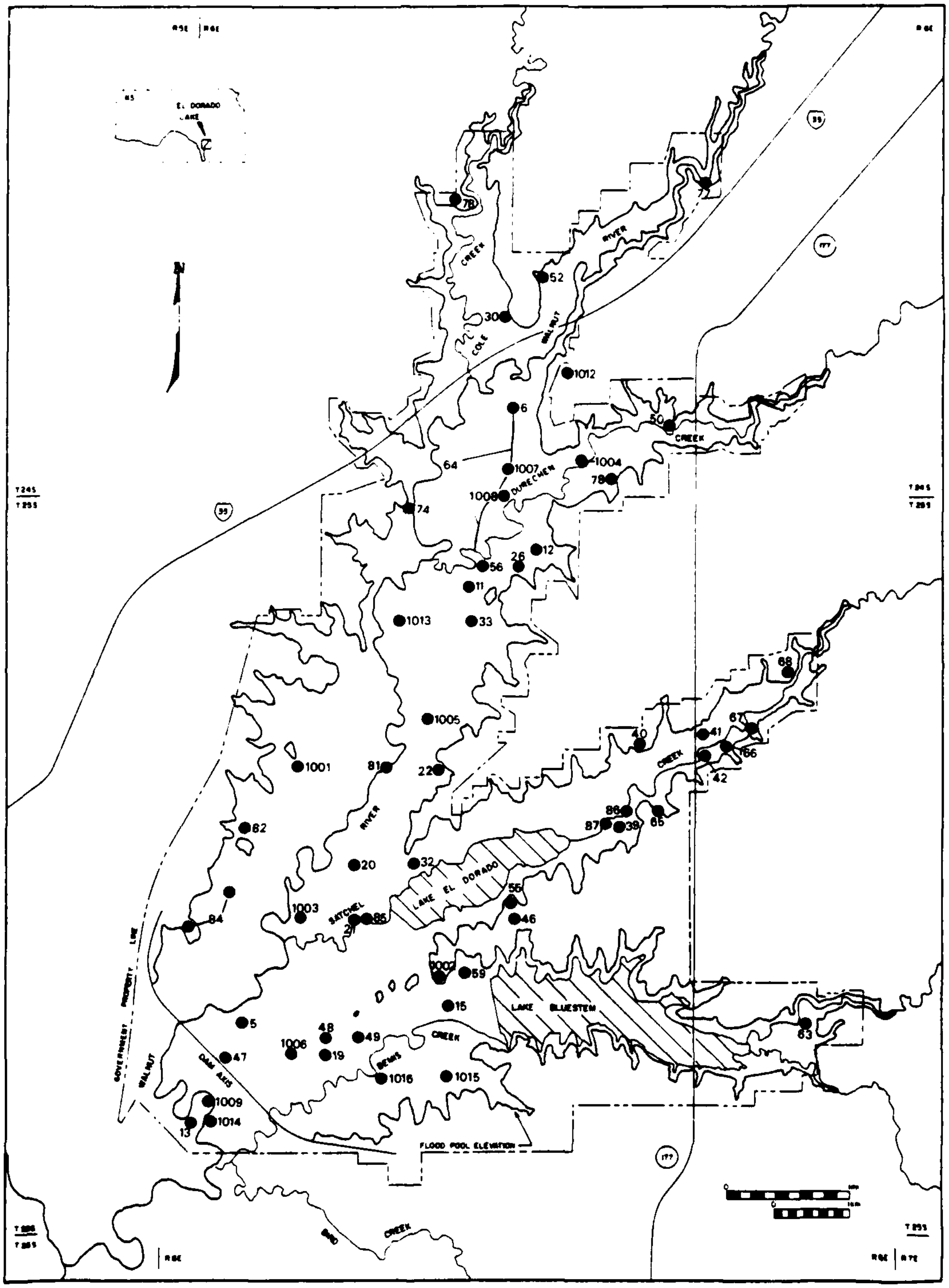

Figure 10.1. Historic sites in the El Dorado Lake area. Two digit numbers are proceeded by H-78-. All numbers in the 1000 series are preceeded by the state and county designation, 14BU.

Selection of Sites

During the course of testing, site selection was hampered by the lack of background data. Throughout the summer of 1978 the compiled record of historic sites was being constantly expanded and modified. At each point where a decision on which site to test was made, the historical archaeologist had to decide on the basis of what was known at that time. This meant that certain important sites were either not tested or hurriedly excavated because they had either not been identified until late in the season or until after the season was over.

The following criteria were used to select sites for testing:

(1) Impact areas: Sites in areas that were being adversely affected by construction during the summer of 1978 were given primary consideration. This criterion was also used to curtail the testing of one site, 14BU1006, in order to test a major site, 14BU1007, that had not been identified until the final week of the field season and was being destroyed in part by a railroad reroute.

(2) Research goals: Each site was evaluated as to its potential to contribute to the overall goals of the project. This placed an emphasis on the earliest sites. Included in the evaluation was a conscious decision to test a variety of site types.

(3) Known historic alteration: Since part of the testing project's goals was to determine the condition of the archaeological deposits, accounts of activity that would have disturbed the archaeological record, were taken into consideration. This criterion was also used to terminate or shift test excavations at two sites, 14BU1001 and 14BU1003, respectively.

Excavation Methods

The basic unit of excavation was the 1 by 1 m. square. When excavations were conducted within the identifiable perimeter of an historic structure, arbitrary units approximating 1 by 1 m. squares were used to grid the interior. Each excavation unit was assigned a number in sequence as it was opened; e.g., Test Pit 1, Test Pit 2, etc.

Both 5 and 10 cm. levels were used when there was no natural stratigraphy to follow. The 10 cm. level proved to be the most efficient of the two and was used on most of the sites.

All soil from the excavation units was screened through ¼ inch wire mesh screens. Artifacts recovered during the screening were bagged by level. All other artifacts were plotted three-dimensionally.

Excavations were generally restricted to the area immediately alongside or within buildings and structures. This eliminated or reduced questions of association between artifacts recovered and the historic occupation of a given place. The decision to restrict testing to those areas within or adjacent to historic structures resulted in lower totals of artifacts than if tests had been used to locate primary trash disposal areas.

Measurements

In many instances in the following pages, the American standard system of measures is used rather than the metric system. This is justified because the structures and artifacts being recorded were built or manufactured according to those units of measure and not the metric system. To employ metric measurements may result in masking possible relationships. For example, if the ice house at 14BU1002 had been recorded in meters rather than feet, the fact that its dimensions were equivalent to one rod by three-quarters of a rod (the rod being a common unit of measure in rural areas) may have been overlooked.

Special Terms

In the following site reports, the terms, "faced" and "dressed", will be used in reference to cut stone. These terms are defined as follows: Faced - a stone that has been modified on a face or faces by a stone mason; Dressed - a stone that has been faced, but the chisel or stone ax marks create a decorative pattern. These definitions were drawn from interviews with retired stone masons and others who were familiar with stone working techniques (William Sturbenz and Mart Arnal, personal communications).

Surface Collections

All the surface collections from the historic sites were grab samples. The value of such samples from sites with long histories of occupation is minimal. New material is continually being deposited on the surface so that a surface collector is just as likely to pick up a fragment of yesterday's pop bottle as a 19th Century bottle fragment. The long timespans of many historic artifacts further hamper the analysis of surface collections. Surface grab samples can have only the broadest of applications but the historical archaeologist is often interested in relatively narrow time periods. For these reasons, the surface collections in this report will be treated as a single artifact category and only the most important or interesting artifacts will be discussed. The entire surface collection will be presented in tabular form.

14BU1001

Site 14BU1001 (Fig. 10.2) fell within the priority area north of the dam, west of the Walnut River, and south of Satchel Creek. The Museum of Anthropology was notified prior to the beginning of the field season that this area would be affected by construction (Gary Leaf, personal communication). It was because this site was located in a priority area that it was selected for testing.

The site is situated in the uplands. Immediately around the house is a wooded area but most of the surrounding fields have been maintained as pasture. A natural spring approximately 1/8 of a mile east of the site is

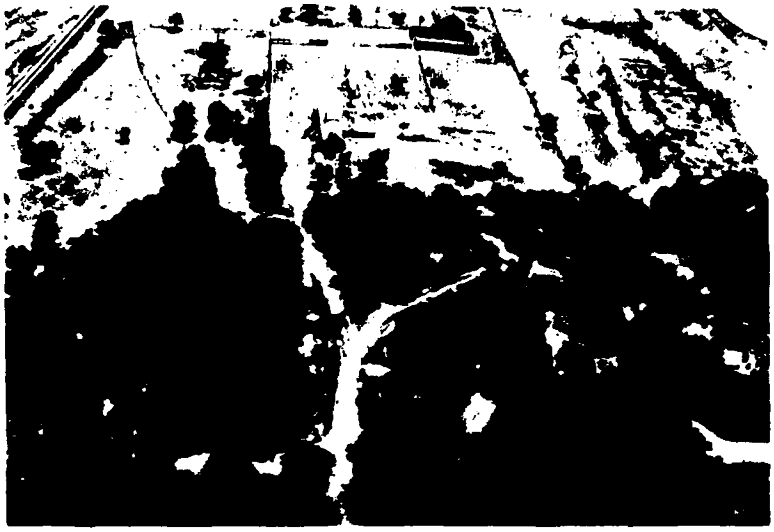

Figure 10.2. Areal view of 14BU1001 (clearing in foreground).

noted for the fact that it has never dried up and may have figured in the settlement of this particular area during historic and prehistoric times.

History

The earliest documentary account of this property is found in the Grantor-Grantee Index 170-174, wherein it was recorded that John M. Rayburn assumed the property from John C. Becker on October 3, 1873. The land involved was the S½NW¼ SEC 17 and the SE¼NE¼ and NE¼SE¼ SEC 18 T25S R6E. A house is shown on the property in the county atlas of 1885 (McGinnis and Thomas 1885). The house is also shown in the 1905 atlas (Standard Atlas 1905), listed as the A. R. Carpenter residence. The property later passed into the possession of the Hazelett family and then the Condell family, who were the last owners.

Architecture

The object of the test excavations was to locate and explore the remains of the two-storied stone house that stood on the site. An exact date of construction is unknown but local informants maintain that it was built in the 1880's. It was assumed that it was the stone house that was shown on the above mentioned atlases. Therefore, it was concluded that the house dated from at least the early 1880's. There is no account of any earlier buildings, but all other stone houses that were investigated had been preceeded by log cabins.

Visible on the site are the cement block basement of a modern house (built in 1938 according to the land's last tenant), an associated shed/garage built from cut limestone blocks, and the remains of a red tile show barn (also built in 1938 according to the informant) used for the prize white-faced cattle that were raised by the landowners. There were also several cement foundations in the area that were associated with additional outbuildings such as chicken coops, hog pens, an earlier garage, etc. All of the above remains and structures are too recent in origin to be considered for this project.

Excavations

A local informant, Mr. Olin Stansbury, identified a level area on a small rise of ground as the spot where the stone house had stood until it burned down. According to Mr. Stansbury, the fire occurred within the past decade. There was no visible evidence of a structure. However, the area was bordered by a picket fence on the west and at the south end of the fence was a well. Since wells were generally in close proximity to houses and as there was no surface indication for a building elsewhere in the area it was decided to open two test pits where Mr. Stansbury indicated the house had stood (Fig. 10.3).

Two 1 by 1 m. test pits were opened. Test Pit 1 was near the center of the level area and Test Pit 2 was near the fence and the well. The pits were excavated in arbitrary 5 cm. levels.

It was obvious after the first level had been removed, that this was an undisturbed area. There were few artifacts recovered from the first and second levels and the third and fourth levels were sterile. At the bottom of the fourth level natural limestone was encountered.

During the test excavations the historical archaeologist continued to work with the historian to locate an additional informant. The new informant was Mr. Harold Snyder, a tenant on the land since the 1930's and the occupant of the house at the time it burned down. According to Mr. Snyder, the two-storied stone house with a two-storied wooden addition had burned in 1960. After the fire, all the stone blocks were hauled away, including the blocks that had lined the cellar. Many of the blocks were given to Joe Lewellen and can be seen in some of the cattle pen walls at 14BU1005. The cellar was then filled in with debris that was transported to the site from all over the county. Filling in the cellar was completed by adding several loads of top soil. Grass was planted in the top soil.

The test excavations had been unsuccessful in locating the house because the building had stood west of the picket fence with the well at its southeastern corner. An examination of the area produced no evidence that a building had once been present. Taking into account Mr. Snyder's report of what happened after the fire, it was decided to discontinue the investigation of the site.

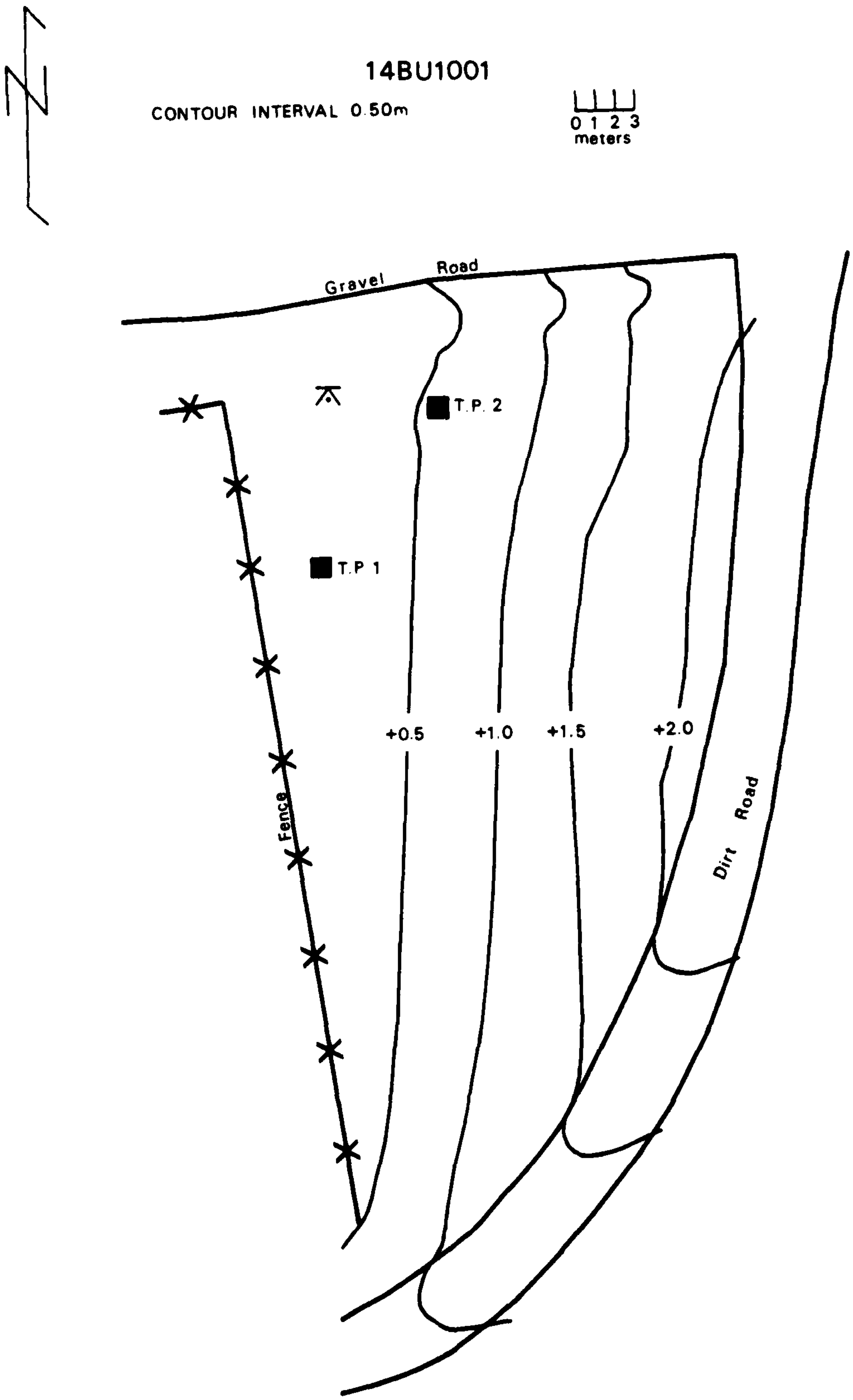

Figure 10.3. Plan of test excavations at 14BU1001.

Artifacts

The assemblage from 14BU1001 is the smallest of all the excavated collections. A total of seven artifacts was recovered, including two animal bones and two unmodified non-local minerals. Only three of the artifacts are directly attributable to the historic occupation. Artifact distributions by excavation unit are detailed in Table 10.1.

Table 10.1. Excavated artifacts 14BU1001.

	T. P. 1	T. P. 2	Total
BOTTLE GLASS			
Clear		1/100%	1
FLAT GLASS			
Green		1/100%	1
UNWORKED STONE	2/100%		2
BONE	2/100%		2

Bottle Glass (n=1)

A single clear bottle glass fragment was recovered from Test Pit 2. It appears to be from the neck of a bottle but it is too small to be of any diagnostic significance.

Flat Glass (n=1)

Thickness: 1/10 inch (2 mm.)

A single fragment of clear flat glass probably from a window pane was recovered from Test Pit 2.

Nails (n=1)

One common square cut nail was recovered from Test Pit 1. It is 1½ inches long (4d), has a flaring head, and the shank tapers in width and thickness. This type of nail was commonly produced between 1810 and 1890. Nails in the 4d range were generally used for shingling or slating (Fontana and Greenleaf 1962:57-60).

Unworked Stone (n=2)

Two specimens of yellow aragonite were recovered from Test Pit 1. Aragonite is a mineral with the same chemical composition as calcite but has a fibrous crystal form (Tolsted and Swineford 1957:39-41). This mineral has not been reported in Butler County.

Bone (n=2)

Both specimens were recovered from Test Pit 1. One specimen is an unidentifiable fragment. The other is the proximal end of a right femur from a bird, species unknown.

14BU1002 - The Foster Site

The Foster site is situated in the upland prairies west of present day Lakes Bluestem and El Dorado. The section line that bisects the site provides a demarcation of activity areas: north of the line was the primary living area, south of the line was the livestock area.

This site was selected for testing because, like 14BU1001, informants maintained that the remains of a stone house were present. Unfortunately, there was no stone house. However, there were two examples of rare structures: a wagon scale and an ice house. These were the focus of the excavations.

History

Charles Foster (Fig. 10.4) homesteaded this site in 1874. Most of the farm, located in the uplands and therefore unsuitable for agriculture, is illustrative of Foster's occupation, sheep raiser. Mr. Foster, in fact, became a very successful sheep breeder.

The Foster family concentrated on raising sheep, but also had other economic pursuits. Archaeological evidence indicates the presence of at least one ice house and a wagon scale. Both of these structures could have provided extra income.

When Foster died in 1909, his son, C. E. Foster (Fig. 10.4), continued to operate the farm. In 1947 the farm was sold to Benny Banks, who retained possession until 1974 when it was acquired by the U. S. Army Corps of Engineers, Tulsa District.

Prior to the summer of 1978 all buildings and structures at this site had been moved or razed. The actual farmstead site is no longer used. The remaining land, including that part south of the road where testing was carried out, is being used to graze cattle.

Architecture

The only structure about which an architectural statement can be made

CHARLES and C. E. FOSTER

Figure 10.4. Charles and C. E. Foster.

Figure 10.5. 14BU1002, north end of wagon scale.

is the wagon scale/ice house that was the object of the test excavations. Construction of the wagon scale was begun by excavating a pit approximately 16½ feet long (north-south) and 12 feet wide, or approximately 1 rod by 3/4 rod, to a depth of 1½ feet. The sides of the pit were lined in uncoursed fashion with minimally faced limestone blocks averaging 1 foot in width. Those faces that abutted the pit sides were not modified.

Prior to building the wall two cement shelves were poured, one each in the north and south ends. While the cement was still wet, a split rail 12 feet long, 14 inches wide, and 2 inches thick was set into it. Attached to the rail were two cast iron scale arms. The presence of cement in the splits emanating out from the points where the bolts secured the scale arms to the board indicated that the arms were already attached to the rail and the cement was still wet when the rail was positioned. The walls were built so that the ends of the rails were encased in limestone.

The arms were positioned off-center; i.e., the western arm was 3 feet from the west wall; the eastern arm was 1 foot from the east wall (Fig. 10.5). This means that the scale box, where weight readings were taken, had to be on the west side. A limestone block positioned three-quarters of the way up the west wall (Fig. 10.6) has been worn smooth on its upper surface suggesting that the scale box was located at that point. The hard compacted soil along the west side, which produces a distinctive metallic ring when struck with a trowel, is indicative of considerable pedestrian activity such as would be associated with the scale box.

Concrete had been poured over limestone blocks on the north and south ends of the scale to produce ramps. The tops of the ramps were approximately 6 inches above the top of the foundation. It is assumed the scale platform, fabricated from wood and metal, was even with the top of the ramps. A determination of weight was obtained by a wagon rolling onto and depressing the platform.

The presence of charred fence posts and barbed wire in the scale pit have been interpreted as evidence that the platform was fenced. Fencing would have allowed the scale to be used to weigh livestock as well as wagons. This scale may have been built specifically to weigh Mr. Foster's livestock.

The wagon scale was destroyed by fire, either accidentally or purposefully, after which its walls were used as the foundation for an ice house. Construction of the ice house began with limestone blocks being used to fill the wagon scale pit. This limestone, most of which was fieldstone or quarry debris, provided support for the weight of the ice. A thin soil covering was probably placed over the stones, then slatted flooring. Railroad spikes in and around the foundation suggest that railroad ties may have been used to build the floor. The remainder of the structure was probably frame.

Informants maintain that the ice house door opened south. This is in part supported by the presence of a cobbled walkway along the east side of the foundation. The cobbles would have been laid to facilitate walking in an area where water run-off from melting ice made the ground muddy. Since the cobbles ran the entire length of the wall, it must have been necessary to traverse this distance frequently, as would be the case if the door were

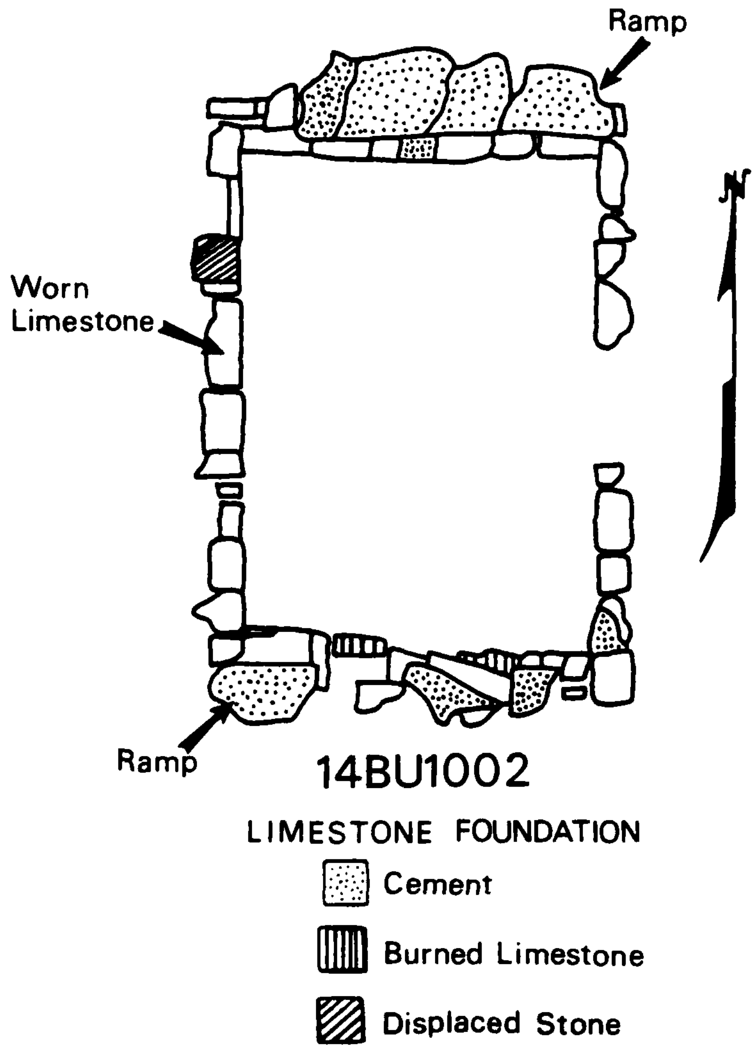

Figure 10.6. *Foster site, 14BU1002. Map of ice house/wagon scale foundation.*

in the south end. It should also be noted that the remains of an alleged second ice house north of the road does have a door in its south wall. Additionally, it has been speculated that the second ice house represents the relocation of the superstructure of the first, thus tending to support the idea of a southern doorway. A door in the south wall seems odd because the predominant winds during the summer come out of the south. Therefore, each time the ice house door was opened during the summer, the ice would be exposed to hot winds.

The plans for building ice houses such as this were available in architectural pattern books popular in the 19th Century. This particular ice

house conforms closely to the specimen illustrated in the 1895-96 state agricultural report (Kansas State Board of Agriculture 1896:340-5) publication, may be more than coincidental. Note the discussion on chronology below.

The chronology of the events discussed above cannot be fixed with great certainty. Obviously, the scale post-dates Foster's homesteading the land in 1874 and it is doubtful that the scale would have been one of the first structures built. An analysis of the barbed wire (see Barbed Wire below) associated with the scale suggests a date for fencing the platform in the mid to late 1880's. It is assumed that the barbed wire fence was put up at the same time that the scale was built, therefore, a construction date in the mid to late 1880's is indicated.

A date for the conversion of the scale to an ice house is more ambiguous than the scale construction date. One informant (Mart Arnall, personal communication) reported buying ice at this site in 1905. The nails recovered from the fill and thus assumed to be associated with the ice house, are a mixture of square and round types which suggests the 1890's (Appendix 10.A Therefore, the conversion could have taken place around the turn of the century. This was about the time that the plans for an ice house appeared in the Kansas State Board of Agriculture (1896) annual report.

It should be noted that a 1910 Liberty head nickel was recovered from the fill above the limestone. This does not necessarily reflect the time that the limestone or soil fill was deposited. The slatted flooring of the ice house would have allowed artifacts to be deposited in the fill throughout the period the structure was in use. It may even have been deposited during or after the postulated moving of the structure.

It is postulated that the ice house north of the road was built using the superstructure of the one from south of the road. This postulation was based on the presence of square cut and wire nails in the specimen north of the road, the similarities in dimensions of the two, and the lack of evidence for the demolition of the earlier structure. As to when the move was made, if it were, there can be no definite answer, yet. Informants report the ice house south of the road operating in 1905 and the one north of the road in the early 1920's (Lee Foster, personal communication). What transpired during the intervening years cannot now be reconstructed. The move to maintain the area south of the road as a livestock area only may have been related to Charles Foster's assuming control of the farm in 1909. A relocation date between 1909 and 1920 for the ice house would not be unreasonable.

Excavations

Excavations at 14BU1002 did not begin with the area around the wagon scale/ice house. Test Area I (Fig. 10.7) was a cattle feeder built with railroad ties. The ties contained square nails and wooden pegs indicating they were not of recent origin. However, the feeder was known to have been built in the early 1960's. The test squares around the structures were to look for evidence of earlier architectural features, in order to examine

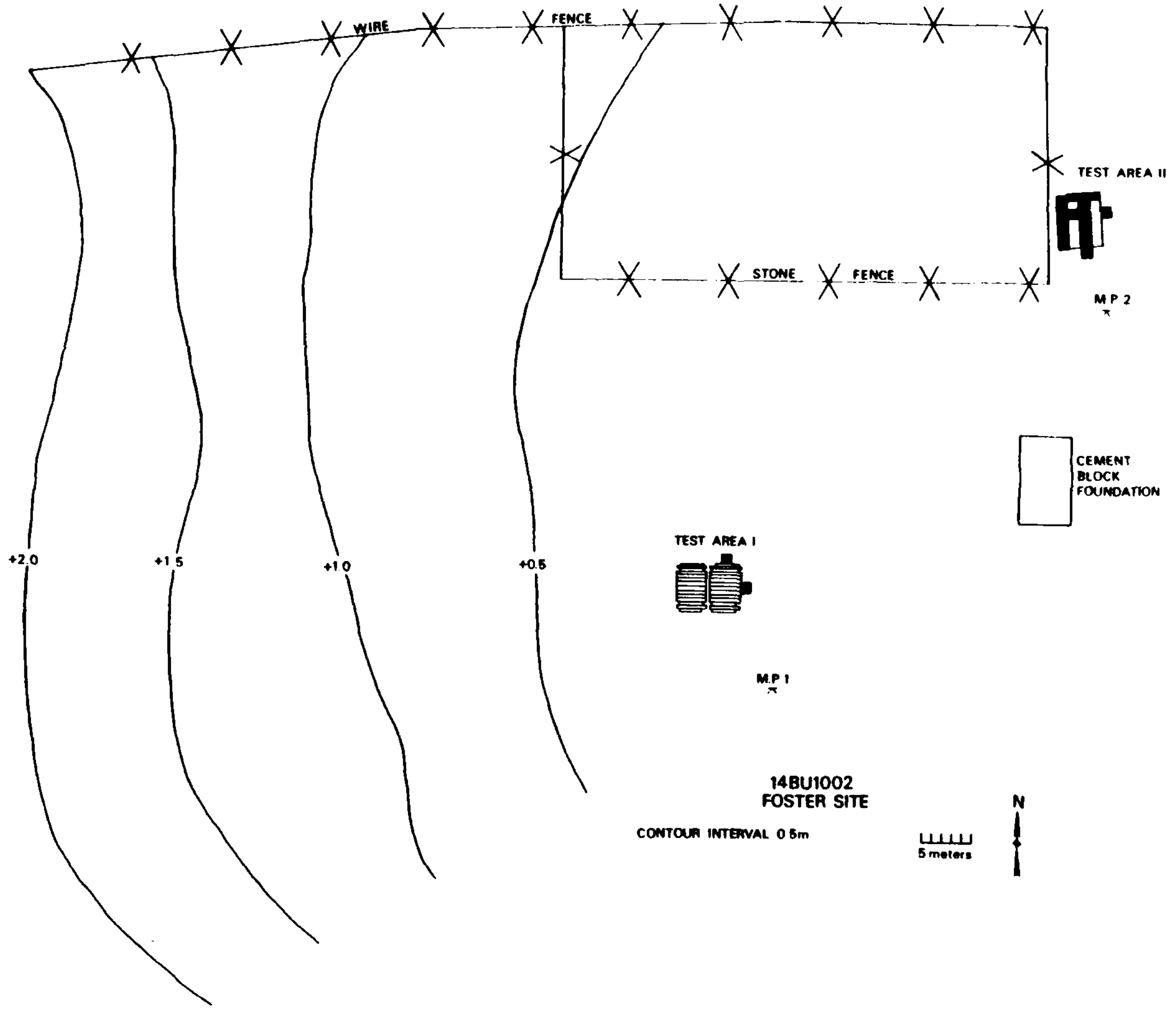

Figure 10.7. Plan of excavations at Foster site, 14BU1002.

temporal continuity in the use of materials and localities.

Two 1 by 1 m. test pits were placed in proximity to the feeder. Test Pit 1 was along the east side. Test Pit 2 was along the north side. The pits were excavated in 5 cm. levels. Once the grass cover and a thin humic soil deposit (less than 2 cm.) were removed, excavators encountered a reddish brown silt. Few artifacts were recovered from these pits.

Both pits were excavated to a depth of 20 cm. There was no evidence for previous structures in the profiles and none of the recovered artifacts indicate any great age. From this data, it was concluded that the cattle feeder had not been built in a previously used area.

Test excavations at the wagon scale/ice house were initiated with two trenches designated Test Pits 3 and 4. Test Pit 3 was a 1 by 5 m. trench that parallelled the west wall. The trench was divided into five 1 by 1 m. units, A - E, south to north.

Test Pit 4 was within the interior of the foundation. Since the dimensions of the interior were not conducive to metric division, arbitrary units that approximated the standard 1 by 1 m. units were used. The foundation was divided into thirds along its east-west axis. The test trench occupied the center third and ran the entire length of the foundation along the north-south axis. Overall, this made the trench approximately 1.03 by 4.15 m. It was subsequently divided into halves (A and B) then quarters, so that the principle excavation unit was 4AN½, which was approximately 1.03 by 1.04 m.

An initial scraping of Test Pit 3 revealed a thin gray loess deposit over a hard, compacted layer of the reddish-brown silt that had been exposed in Test Area I. Since this horizon had already proven sterile, efforts were concentrated on Test Pit 3D, which included the area where the only worn stone in the foundation was located. As was anticipated, the silt levels were sterile, but excavation continued until the bottom of the foundation was reached at 48 cm. below the surface. An examination of the foundation stones exposed in the east profile, revealed that the exterior faces had been left unmodified.

The first levels of Test Pit 4 were the same gray loess as that found in Test Pit 3. This loess represents an eolian deposit. As such, it provides an excellent example of an N-transform (Schiffer 1976:15). In the north end of the scale the loess had buried the foundation and partially covered the concrete ramp. While in the south end, the loess actually occurs slightly below the top of the foundation. This variation in depth of deposit is not a cultural feature, but is due instead to the fact that for most of the year winds come out of the south and therefore, eolian deposits accumulate more in the northern end than the southern. The thickness of the deposit varied from 30 cm. in the north to approximately 5 cm. in the south. The majority of the nonmetallic artifacts were recovered from the loess levels.

The loess overlay a level of limestone that averaged 40 cm. in thickness (Fig. 10.8). The limestone pieces were not uniform in size although most

Figure 10.8. 14BU1002, limestone fill of ice house, looking north.

exceeded 30 cm. in at least one dimension. Angular edges and tool marks on some of the pieces indicated they were quarry debris. The remainder of the stones were field stones, unmodified pieces that can be picked up at outcroppings throughout the lake area. Few artifacts came out of the limestone level. It was removed as a unit.

When the limestone was removed from Test Pit 4AN½, the west arm of the wagon scale with the attached charred rail and cement shelf was exposed. The top of the arm which was almost even with the top of the foundation had become visible after the first few stones had been removed. Shovel tests revealed another arm to the east. Two more test pits were opened to expose the entire northern end of the wagon scale. Shovel tests were also used to verify the presence of arms at the southern end of the scale. Those arms were not further exposed.

Test Pit 5AS½ included the area within the foundation opposite the heavily worn stone in the west wall. Since this stone had been interpreted

as the location of the scale box and thus a high activity area, it was felt that deposition of artifacts was likely to be greater here than in other excavation units. A quantity of material was recovered, but cannot be associated with the operation of the scale, per se. Most artifacts were deposited on a level of burned earth at the bottom of the pit, suggesting that the scale pit had been used for trash disposal subsequent to its burning.

Test Pit 6 was along the exterior of the east wall, directly opposite Test Pit 3D. The first 5 cm. of this pit were the same gray loess that had been present in previous units. The next 5 cm. were comprised of chert and jasper cobbles in the 2-4 cm. size range. This cobble layer had been deposited to facilitate walking in an area where the run-off from melting ice made the ground muddy.

The final test pit opened at this site, Test Pit 8, was along the south side. This area would have been in front of a south-facing doorway located in the center of the wall. Very few artifacts were recovered from this pit. The cobble layer present along the eastern wall did not extend to this point. There were some cobbles present, but these probably represent displacement of stones from the walkway. A cobble layer would not have been necessary here because drains would have gone to the sides, not the main entrance.

Artifacts

The excavated assemblage from 14BU1002, which except for nails (Appendix 10. A) is detailed in Table 10.2, at first inspection appears large. "Wire" is responsible for the high total number of artifacts recorded. Since the 161 wire specimens probably represent a few actual pieces in an advanced state of decomposition, only a small number of artifacts were in fact recovered.

A small number of artifacts representing only a few types, is the kind of assemblage that would be expected from a nonhabitational site such as a wagon scale or an ice house. Ninety percent of the assemblage is metal, most of which is classifiable as architectural (nails, spikes, and staples) or use-related (wire, barbed wire, and scale parts). The small number of ceramic specimens do not represent high quality wares. Everything recovered from this site can be characterized as utilitarian. It is suggested that with the exception of the architectural elements and scale parts, this assemblage was deposited both purposefully and accidentally as refuse.

Bottle Glass (n=5)

All non-flat pieces of glass were classified as bottle fragments. None of the specimens were of sufficient size to determine type or age of container. Color: Clear - 2; Milk glass - 3.

Flat Glass (n=5)

Thickness: 1/10 inch (2 mm.).

Table 10.2. Excavated Artifacts, 14BU1002.

TEST PIT	1	2	3A	3B	3C	3D	3E	4A	4B	5AS½	5AN½	6	7	8	TOTAL
BOTTLE GLASS															
Clear	1/50%								1/50%						2
Milk								2/67%			1/33%				3
FLAT GLASS															
Clear		1/20%						1/20%	2/40%		1/20%				5
JET JEWELRY									1/100%						1
WHITE GLAZED IRONSTONE	1/25%								2/50%		1/25%				4
EARTHENWARE															
Albany/Albany												1/50%	1/50%		2
Red/Red								1/100%							1
Red/Albany														1/100%	1
Tan Salt/Albany												1/100%			1
WIRE						39/24%	1/.62%	99/61%	6/4%	5/3%	1/.62%	3/2%	7/4%		161
BARBED WIRE						2/12%		6/38%	1/6%	2/12%	2/12%	1/6%	2/12%		16
TIN CANS									1/33%	2/67%					3
COIN										1/100%					1
RAILROAD SPIKES				1/50%		1/50%									2
STAPLES						1/14%		4/57%	1/14%	1/14%					7

Table 10.2. (Continued).

TEST PIT	1	2	3A	3B	3C	3D	3E	4A	4B	5AS½	5AN½	6	7	8	TOTAL
WAGON SCALE PARTS											1/50%		1/50%		2
MISC. METAL ARTIFACTS								2/28%	1/14%	4/57%					7
MISC. IRON	1/7%			1/7%		1/7%		4/27%	2/13%	3/20%		1/7%	2/13%		15
BONE							1/20%	3/60%		1/20%					5
WORKED STONE								1/50%		1/50%					2
UNWORKED STONE								1/11%	6/67%	2/22%					9

All five specimens were classified as clear glass but they do exhibit a green tint when viewed obliquely. These pieces are probably fragments of a window pane. Rather than being associated with the ice house, they probably originated at the ruin of the original Foster house which was moved south of Test Area II in 1947 (Fig. 10.7.).

Jet Jewelry (?) (n=1)

This artifact is a melted piece of black glass. Classification of this piece as jet jewelry is based on its color and a reconstruction of its probable shape: a black, bead-like object. Jet jewelry, which was made from black glass, was very popular in the latter part of the 19th Century.

Ceramics (n=9)

Table 10.2 details the specimens recovered. None were sufficiently large to allow an identification of the type of vessel. The earthenware sherds probably represent jugs and bowls, but no rims that could be used to identify the type were recovered. The ironstone specimens probably represent a saucer or dish since little curvature is present. One simple ironstone rim was recovered but it was too small to be of use in identifying the type of vessel.

Coin (n=1)

This was the only coin recovered during the summer's excavations. It is a 1910 Liberty nickel (Fig. 10.9). On the obverse is a left facing profile of Liberty wearing a coronet inscribed with the word, LIBERTY. Thirteen stars encircle the device and the date appears at the bottom. On the reverse is a Roman "V" within two half wreaths of corn, cotton, wheat, and tobacco. UNITED STATES OF AMERICA appears in the radius above and CENTS in the radius below. The motto E PLURIBUS UNUM occurs between the wreaths and the lower inscription. This type of nickel was minted between 1883 and 1912 (Reed 1972:119).

Tin Cans (n=3)

Three badly corroded metal artifacts were classified as tin cans. The cans were actually tin coated sheet iron. All specimens appear to be modern open top flange sealed cans. This type of can was developed early in the 19th Century and began growing in use after 1859. A technological advance in 1893 resulted in this type of can replacing the popular hole-in-top can by 1902 (Fontana and Greenleaf 1962:72-3). None of the specimens were complete enough to permit measurements. The absence of hole-in-top cans from the assemblage is consistent with a late 19th Century date for the conversion of the scale to an ice house.

Metal Scale Parts (n=2)

Only two of the metal artifacts that were recovered can be directly attributed to the wagon scale. These are the scale arms (Fig. 10.10). Each arm rests on an iron plate 7/8 inch thick, 7 inches wide and 11 inches long. The arm, 1¼ inches thick, curves and narrows as it extends up to a height

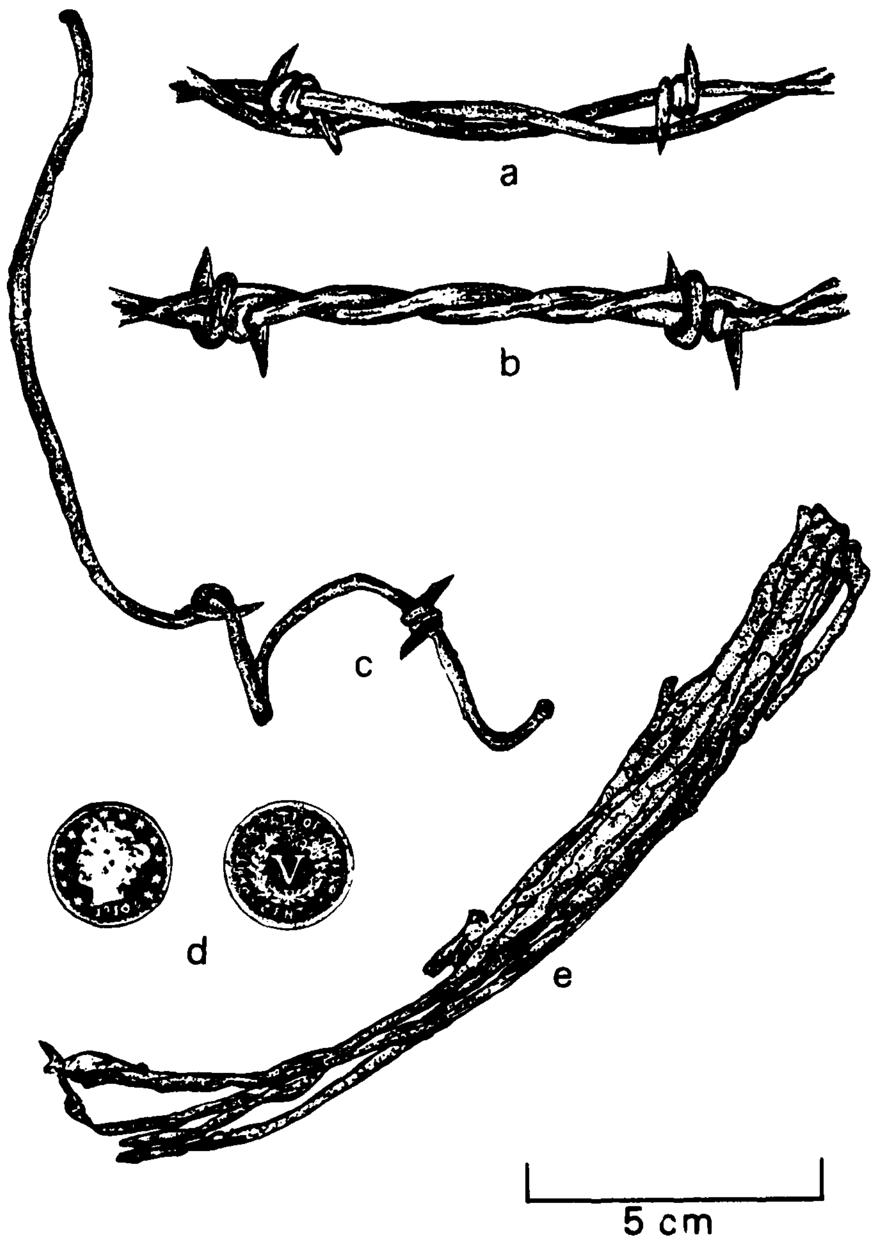

Figure 10.9. Foster site, 14BU1002, artifacts: (a) Glidden's "Winner"; (b) Brotherton 2 strand; (c) Roger's variety; (d) Liberty nickel; (e) wire bundle.

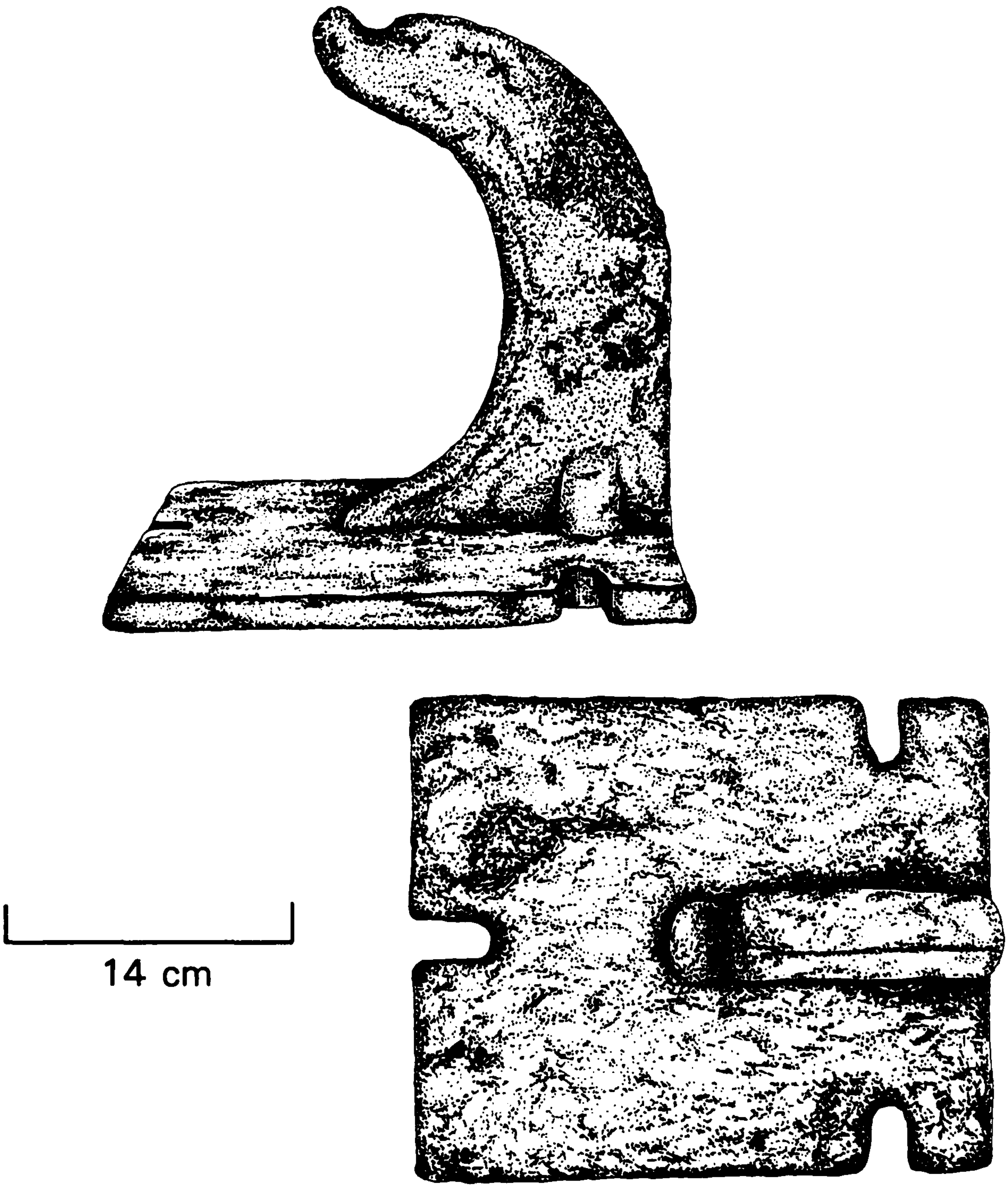

Figure 10.10. Foster site, 14BU1012: wagon scale arm - lateral and ventral view.

of 11½ inches above the plate. There is a groove at the top of each arm where the scale body rested. Arm and plate were cast together in a two piece mold. A seam running along the middle of the piece is still visible. There were no identifiable maker's marks. Each arm was secured to the plank by three bolts. One arm had two square-headed cap screws and one carriage bolt, the other had three square-headed bolts.

Wire (n=161)

The sample from 14BU1002 contains many different gauges of wire. All specimens were iron, none were galvanized, and none were made from modern alloys. Most of the specimens were short, less than 10-15 cm. long. They probably represent decomposed pieces of longer lengths of wire originally deposited. The remains of a bundle of wire (Fig. 10.9e) was recovered from the burned earth floor of Test Pit 5AS½. It was among a quantity of material indicating a trash fill after the wagon scale had burned.

Barbed Wire (n=16)

Of the 16 pieces of barbed wire that were recovered, 7 were identifiable (there were actually 8 identifiable specimens because one piece was comprised of two different types of wire twisted together). Four of the specimens, more than any other type, are Brotherton 2 strand. This was a wire with a double, round line and a round two point barb (Fig. 10.9b), patented in 1878 (Thurgood 1972:8). Brotherton 2 strand was common in the Plains area until the turn of the century (McCallum and McCallum 1965:254-5).

One specimen of galvanized single round line with a two point barb (Fig. 10.9c) is an example of the wire patented by Charles Rogers in 1888 (Thurgood 1972:5). A second nongalvanized specimen has tentatively been designated this type.

The final type identified is the "Winner" by Glidden (Thurgood 1972:10). Patented in 1874, this round double line wire with a round two point barb (Fig. 10.9a), was the first barbed wire ever patented and was the most popular type used in the west. Modern wire strongly resembles the "Winner". Two specimens, one galvanized the other not, were recovered. Galvanizing was a technique introduced between 1884 and 1892, the modified period of wire production (McCallum and McCallum 1965:237). The galvanized piece had been twisted together with a piece of ungalvanized Brotherton 2 strand. The presence of galvanized and ungalvanized specimens of the same wire with the galvanized example attached to the Brotherton wire, suggests a time early in the modification period, perhaps the late 1880's. The Roger's wire with an 1888 patent date, supports this time approximation.

Nails (n=62)

A full discussion of the nails recovered from 14BU1002 is contained in Appendix 10.A. A variety of nail sizes are present in the assemblage, including those for lath work, finishing, casing, flooring, boarding, and framing. This variety suggests the presence of a frame superstructure. The predominance of wire over square cut nails (35 to 9) indicates that the construction took

place after 1890. The relatively low number of nails recovered indicates that the superstructure was moved rather than destroyed or allowed to deteriorate in place.

Railroad Spikes (n=2)

Two railroad spikes were recovered from Test Pits 3B and 3D. Both were in the first level. The specimen from 3B is 5½ inches long, the other 7 inches. It is suggested that these spikes are associated with the railroad ties used as flooring in the ice house.

Staples (n=8)

Sizes: two 1 inch; one 1¼ inch; one 2½ inch; four broken.

All specimens are iron. Staples were used to attach wire to fence posts and other architectural functions.

Miscellaneous Metal Artifacts (n=7)

Included in this class is a 7/8 inch pipe section 3 5/8 inches (93 mm.) long, one roller pin (possibly part of the scale mechanism), and five bolts. Of the five bolts, two are ¼ inch Philadelphia carriage bolts, 6½ inches and 3 inches long, respectively. The other three are square headed cap screws. Only one of these can be measured: it is approximately 3/4 inch by 10 inches. The bolts may also have been associated with the scale.

Miscellaneous Metal (n=15)

All specimens in this class are iron. Most of the pieces are fragments of sheet iron, possibly tin plated. Included in this class are possible tin cans and other artifacts that have deteriorated too much to be recognizable.

Chipped Stone (n=2)

Both specimens came from the loess fill in the foundation. One is a graver made on a patinated jasper cobble. It has a length of 23 mm., a width of 15 mm. and a maximum thickness of 8 mm. The other specimen is a flake of grayish-blue chert from the Florence formation. It has been marginally retouched along one lateral edge. A broken projection on the proximal end suggests the flake may have been a graver or perforator.

These artifacts most likely did not originate at this site. They probably were at one time part of the cobbled walkway.

Unworked Stone (n=9)

Six of these specimens are chert or jasper cobbles. The other three specimens are flakes of Florence formation chert. All of these unworked pieces of chert and jasper were recovered from the loess fill. It is suggested that they were all part of the cobble walkway.

Bone (n=5)

Only one of the bone specimens is identifiable. It is the proximal end of a bird femur, species unknown, possibly chicken.

14BU1003 - The Marshall Site

The Marshall Site, 14BU1003, is located on the east bank of the Walnut River. Approximately 200 m. to the north is 14BU4, a multicomponent prehistoric site (Eoff and Johnson 1968; Fulmer 1976).

Topographically, the site is situated on the fairly level southern end of a "north-south trending rise measuring 200 m. in length by 25 m. in width on the first terrace above the east side of the Walnut River" (Eoff and Johnson 1968:6). There is little relief in this portion of the field (Fig. 10.11).

History

This land was originally owned by William Thurman of whom nothing is known except that he sold the land to W. C. Fraker and W. D. Peyton, Wichita hardware merchants and former El Dorado residents. Fraker and Peyton, in turn, sold the land to William Marshall on May 14, 1874. The land passed through the hands of the Marshall family and other area residents until the Corps of Engineers acquired it in 1974 (for a complete listing of ownership changes see the Historic Sites Survey form for this site in the background data volume)(Roberts and Wilk 1981).

At the time the Marshalls acquired the land, improvements had already been made. S. P. Marshall, son of William, reported in the March 26, 1906 *Walnut Valley Times* the following buildings and structures were present at the time his family moved onto the land: "two nicely hewn, well built log houses," stables, corrals, and a cooper (the latter three also of logs). In addition, the farm was enclosed with "an old style rail fence". Of these improvements, only one of the log houses survives, and there is a question as to whether it is one of the houses Marshall described or a later improvement. Fulmer (1976:47) reported the presence of postmolds and compacted earth in one of his test trenches at 14BU4, which suggests the location of a portion of the fence.

The log house occupies a position approximately 200 m. west of its original location. It was moved to its present spot ca. 1900 when then owner, Washington Teeter, began having flooding problems with the limestone basement. The location to which the house was moved was not on higher ground, but a new cellar was not excavated thereby eliminating the seepage problem. The original basement had its limestone walls removed and was filled in when the original house site was put under cultivation. An area of dense historic ceramic and glass scatter marks the original house site.

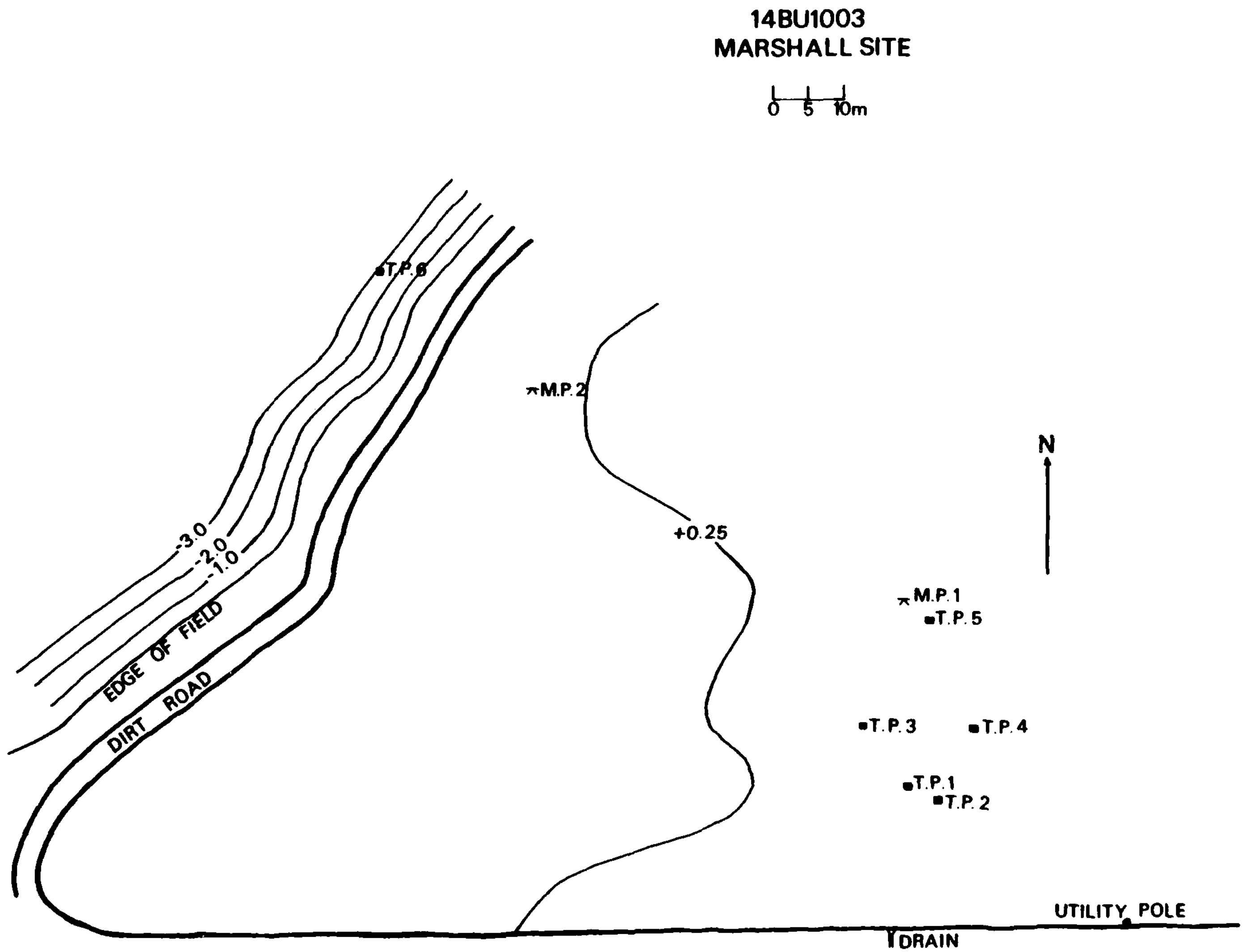

Figure 10.11. Plan of test excavations at the Marshall site, 14BU1003.

After its relocation, the cabin was occupied until ca. 1905 when a larger, more modern house was built. From that point on, the cabin was used for various purposes such as storage and animal barn. The fact that it was still being used as an animal feed barn when the last owners left, points to the sturdiness with which it was built.

At this time, the house is not being used, but is in the possession of the Butler County Historical Society. Plans made by the society call for the house to be moved to an historic sites park that is being developed. Unfortunately, vandals are hastening the demise of this important building.

Architecture

The surviving house (Fig. 10.12) is a 1½ story vernacular style oak log cabin. It measures 18 ft. 1 in. by 16 ft. The timbers in the walls are a uniform 2 feet in width and are joined by dove-tail notching. On the interior against the north wall is an enclosed stairway, an unusual feature for such a house. The stairway leads to the sleeping loft. A chimney of "hammer dressed native lime stone (sic)", now missing, was in the west end of the cabin (Marshall 1906). The gable roof still retains most of the cedar shingles. Only a few of the walnut panels that covered the interior are still present. The house now rests on its floor beams.

The oak timbers in the walls show the distinctive marks made by a circular saw, indicating that they had been produced in a saw mill. Local oral history maintains that the logs had been milled in Emporia, Kansas, then transported to the site by oxteam and assembled by William Marshall during the summer of 1874 (Madge Jones, personal communication). This cannot be documented. It should be noted that several saw mills were operating in the lake area by the 1870's. These were quite capable of producing the logs used in the cabin. The fine walnut paneling may not have been within the local mills' abilities and may have been imported.

Although log dwellings were typical for the early settlers, there is nothing typical about this particular house. The presence of walnut paneling, an enclosed interior staircase, and saw mill produced timbers indicate that this was <u>not</u> a dwelling erected simply because wood was available and shelter was necessary to survival. This was a deliberately planned, expensively produced house. Its construction was undoubtedly meant to reflect the owner's wealth and status. The importance of the building in local oral history and the mythology that has developed about its construction testify to the fact that this house was indeed something out of the ordinary.

Whether or not the house was built by Marshall in 1874 is debatable, but a construction date in the late 1860's or early 1870's is the most reasonable. This was the period during which the original settlers were abandoning their first homes and building larger, more permanent houses (the stone houses at 14BU1008 and 14BU1005 are prime examples). In many instances, this second dwelling was a stone house. Why this substantial house was built of wood may be a reflection of the builder's economic preoccupation: If the house was not built during the Marshall family occupation, then the logical choice as builders would be Fraker and Peyton, the

Figure 10.12. Marshall site, 14BU1003: log cabin viewed from the southwest.

Figure 10.14. Marshall site, 14BU1003: faced limestone blocks in the wall of Test Pit 6.

hardware merchants. A hardware merchant is a vital link in the chain of supplies necessary to build a house such as this, but has little to contribute to a stone house. Therefore, the house may have been constructed by Fraker and Peyton during the substantial building phase of the late 1860's and early 1870's, but reflecting their own economic interest in wood construction as opposed to stone.

If Marshall built the cabin, he was conforming to what appears to be a pattern among the late arrivals in the lake area. Settlers who did not arrive until the late 1860's and later tended to build wood houses, while the original settlers built stone houses. This may be related to familiarity with building materials. A subsequent section will dicuss this more fully.

Excavations

Five 1 by 1 m. test pits were set out in Test Area I, the original cabin location. Test Pits 1 and 2 were placed within the area with the densest concentration of surface material, 3 and 4 were outside the concentration, and 5 was in one of the smaller areas of dense historic scatter. The results of the tests were negative in so far as detecting undisturbed cultural deposits and determining the exact location of the log cabin were concerned.

All cultural material was recovered from the dark, humic soil of the plowzone, the first 30 cm. Under the plowzone was a sterile, gray, sandy soil that appears to correlate with Fulmer's Zone B (1976:46). However, Fulmer noted this soil at 90 cm. not 30 cm. The presence of this soil so close to the surface may be related to why the southern half of this field is so level. Yet, the presence of historic surface material precludes any suggestion of artificial leveling by farmers.

The soils in all five test pits were the same. There was no evidence for a filled-in cellar. The house undoubtedly stood in the vicinity of the surface scatter, since the material was of a household nature. It has been demonstrated that plowing will affect the vertical distribution of artifacts, but does not disturb the horizontal distribution of deposits sufficiently to make identification of an historic location impossible (Lewis 1978). Therefore, further testing may have eventually located the filled-in cellar, but once it had been determined that there were no intact deposits, it was decided that further testing for the feature would not be necessary.

Attention was turned to Test Area II on the slope of the east bank of the Walnut River, northwest of Test Area I. This test was designed to recover artifacts from a primary disposal area. The river bank was designated a primary disposal area because the typical response to a query on how trash was disposed of during the early days was, "They threw it in the creek." The exact location for the test was selected because it was a break in the tree-line and historic material was visible down the entire slope of the bank. Although the visible material was definitely 20th Century and probably not more than a few years old, it was felt that the locus of deposition was unlikely to change very often, and therefore, older deposits would be found in the subsurface levels. This proved to be the case.

Test Pit 6 in Test Area II was excavated to a depth of 80 cm. below the surface. Throughout, the soil was a uniform dark humic type. At 80 cm. below the surface, there was a noticeable clay content in the soil.

The artifacts that were recovered from this pit more than doubled the total number of excavated specimens from this site. However, the artifacts from Test Area II can be no earlier than the turn of the century. Most appear to date to the 1920's and 1930's (art deco glass fragments, phonograph record fragments, etc.) suggesting that this was a trash disposal area utilized after the cabin had been moved.

A profile of Test Pit 6, showing all three dimensionally plotted artifacts (Fig. 10.13), indicates continual deposition of material with no intermittant soil development. As can be seen in Figure 10.13, the majority of the artifacts came from the western half of the pit. There was a quantity of ash mixed with the soil and artifacts in the western half. Although none of the artifacts show any sign of fire damage, the quantity of material in the western part of the pit may reflect a single deposition of debris after a fire or else a stove or fireplace cleaning, mixed with other household refuse, and discarded together.

In the bottom of the northwest corner of the test pit, jutting out of the profiles, were five faced limestone blocks (Fig. 10.14). These blocks must have been associated with one of the buildings or structures present at the site. It is suggested that these blocks were part of the limestone cellar walls that were disposed of ca. 1900. These stones represent the first level of cultural deposition in this test unit; no artifacts were recovered from levels below them. This finding supports the designation of this area as a post-1900 primary disposal area.

Artifacts

The remarkable aspect about the assemblage from the Marshall site, detailed in Tables 10.3 and 10.4, is the diversity. Not only are a number of different types present, but there is a variation in the quality of the artifacts. These assemblages contain high quality wares as well as utilitarian types. This is the type of variation that is expected around a habitation site.

Another important aspect of these assemblages is the correlation between geographic and temporal dispersion. There is not much overlap between artifact classes from the two test areas. The assemblage from Test Area II suggests a 20th Century deposition, while the assemblage from Test Area I is like those which characterize other 19th Century sites.

Surface Collection (n=38)

No diagnostic artifacts were recovered from the surface. As can be seen in Table 10.3, however, the collection does show a remarkable diversity of types. Stoneware rim fragments, such as illustrated in Figure 10.15d, are too small to identify positively, but appear to be from large containers. One salt glazed specimen, Figure 10.15a, may be a churn fragment. The variety

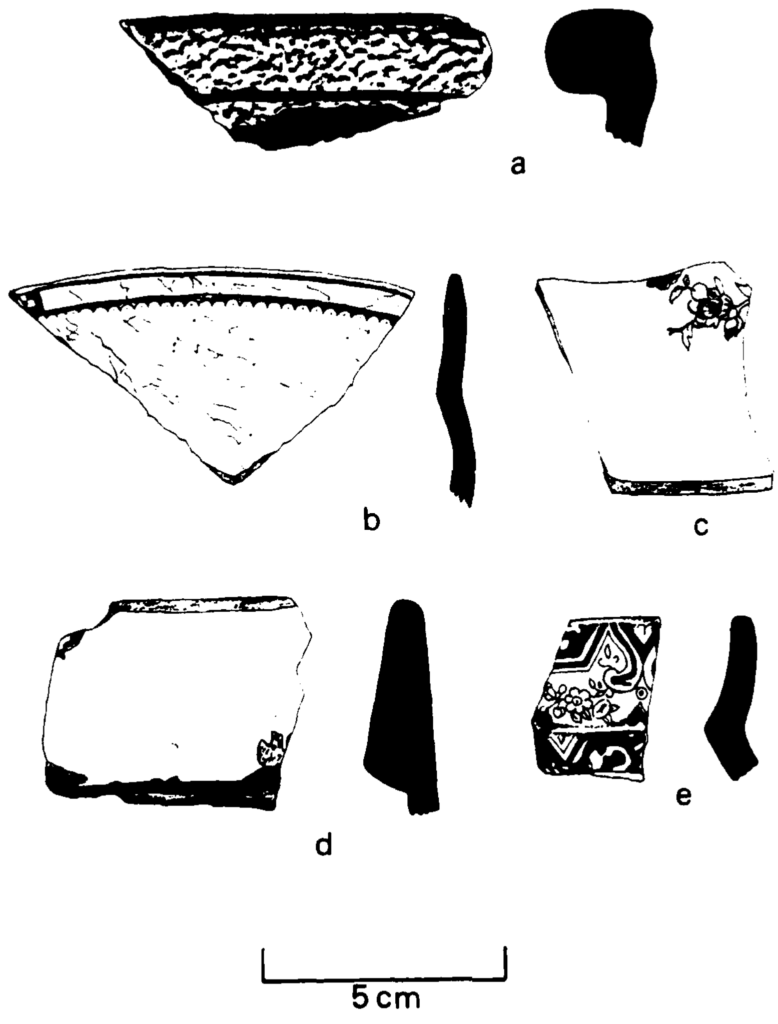

Figure 10.15. Marshall site, 14BU1003, ceramics: (a) possible churn fragment, salt glazed; (b,c) decalware; (d) stoneware; (e) flow blue ware.

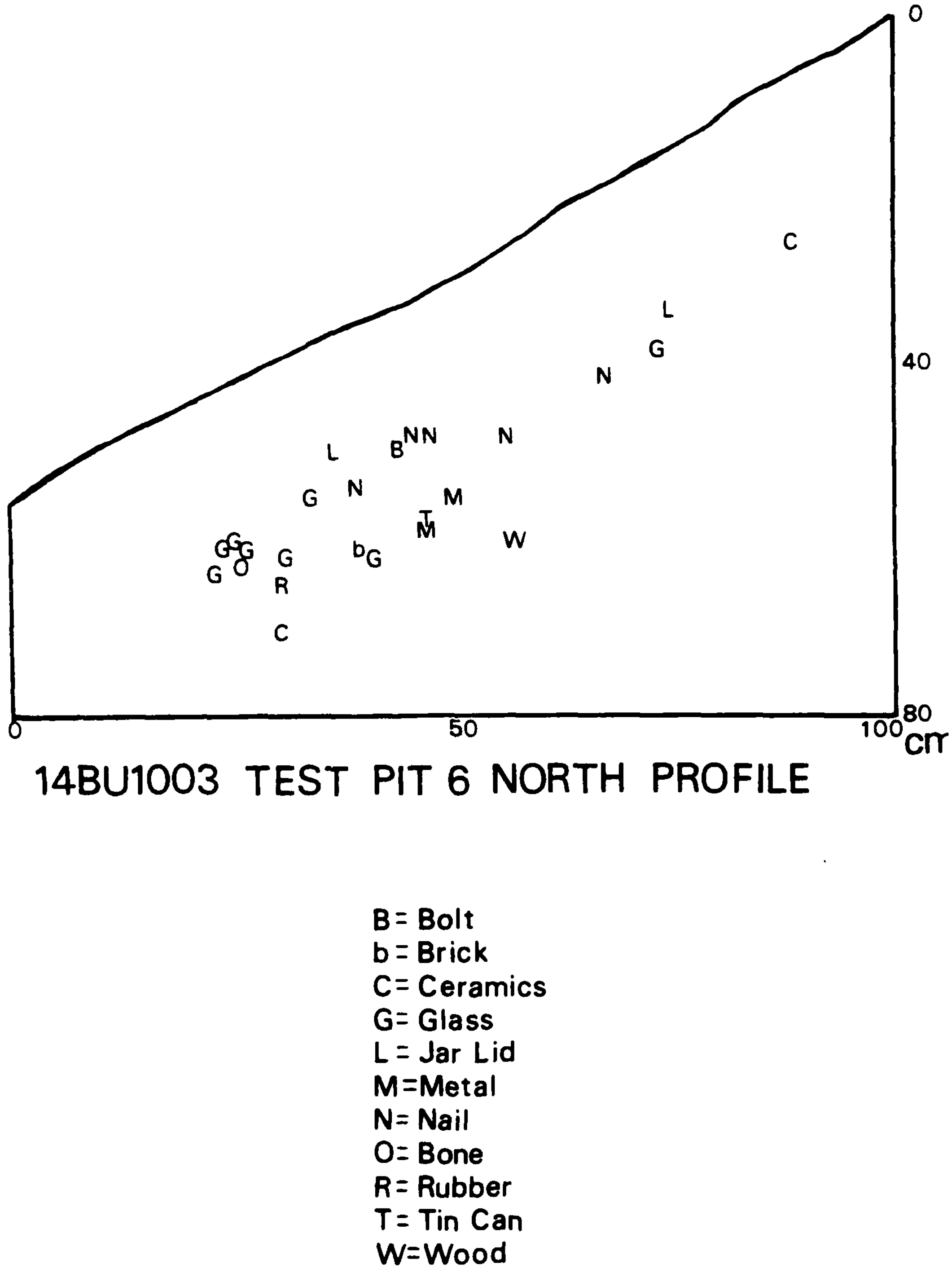

Figure 10.13. Marshall site, 14BU1003: profile of Test Pit 6.

Table 10.3. 14BU1003, Surface Collection.

TYPE	NUMBER OF SPECIMENS
BOTTLE GLASS	
Clear	5
Green	2
Milk	1
FLAT GLASS	
Clear	4
Green	1
Manganese	2
EARTHENWARE	
Albany/Albany	1
STONEWARE	
Albany/Albany	3
Bristol/Bristol	2
Gray/Brown	1
Gray Salt/Gray Salt	1
Light Brown/Albany	1
White/White	3
WHITE GLAZED CHINA	1
WHITE GLACED IRONSTONE	1
WAGON STEP	1

and number of these large pieces of crockery, may be related to the large scale production of cheese in the lake area (Wilk, Chapter 9, this volume).

Included in the surface collection is a cast iron wagon step fragment (Fig. 10.18b). This is the only positively identified example of wagon hardware from the site.

Bottle Glass (n=58)

No specimens from Test Area I were diagnostic. Most are very small fragments.

There are four diagnostic bottle fragments from Test Area II. All are probably jar fragments rather than bottle remains, *per se*. Two of the pieces are rim sherds. One had a screw cap (Fig. 10.16d), the other (Fig. 10.16e)

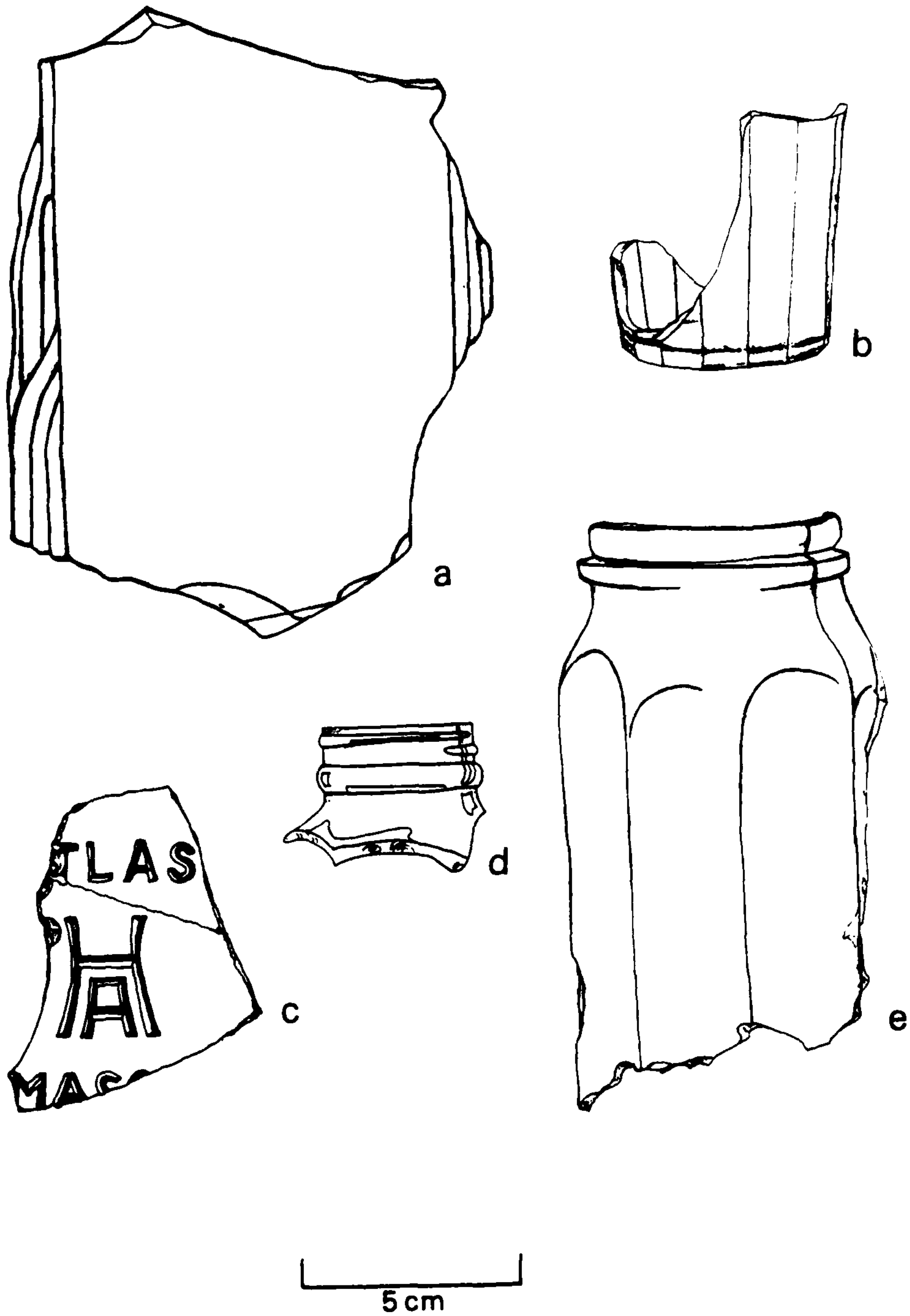

Figure 10.16. Marshall site, 14BU1003, glass artifacts: (a) pitcher fragment; (b) faceted drinking glass fragment; (c) Hazel-Atlas Mason jar fragment; (d) post-1904, screq cap bottle neck; (e) post-1904, snap-pn lid jar.

Table 10.4. Excavated Artifacts, 14BU1003.

TEST PIT	1	2	3	4	5	6	TOTAL
BOTTLE GLASS							
Amber					2/50%	2/50%	4
Clear	6/15%	2/5%	1/3%	2/5%	7/18%	21/54%	39
Green	1/50%		1/50%				2
Manganese	2/40%					3/60%	5
Milk						3/100%	3
Olive Green					1/100%		1
Yellow					4/100%		4
FLAT GLASS							
Clear	2/20%	1/10%	2/20%		3/30%	2/20%	10
DRINKING GLASS						2/100%	2
GLASS PITCHER						1/100%	1
WHITE GLAZED IRONSTONE	5/50%	1/10%	1/10%	1/10%	1/10%	1/10%	10
WHITE GLAZED CHINA	1/100%						1
FLOW BLUE CHINA				1/100%			1
PEARLWARE				1/100%			1
DECALWARE						2/100%	2

Table 10.4. (Continued).

TEST PIT	1	2	3	4	5	6	TOTAL
STONEWARE							
Albany/Albany	1/33%	2/67%					3
Albany/Gray		1/100%					1
Buff/Albany			2/100%				2
Deep Red/Deep Red			2/100%				2
Gray Salt/Red				4/100%			4
Gray Salt/Red Slip			1/100%				1
Yellow/Red			1/100%				1
PORCELAIN INSULATOR						1/100%	1
WIRE						88/100%	88
BARBED WIRE						1/100%	1
TIN CANS						1/100%	1
STAPLES				1/50%	1/50%		2
MISC. METAL ARTIFACTS				1/11%	1/11%	7/78%	9
MISC. METAL	2/13%	3/20%	2/13%	3/20%		5/33%	15
MISC. NON-METAL ARTIFACTS						15/100%	15
UNWORKED STONE			1/100%				1
DAUB	1/50%				1/50%		2
BONE	1/25%					3/75%	4

a snap-on lid. Both were machine made after 1904, as can be determined by their seams. The screw cap specimen has an orifice interior diameter of 1¼ inches (32 mm.) and is possibly from a milk bottle. The snap-on lid specimen has an orifice interior diameter of 2 3/8 inches (56 mm.). It had nine or ten round top facets, 30 mm. wide, that alternated long and short. There was one central facet that was longer and wider (40 mm.) than the others. This facet probably bore a label. What this jar contained cannot be determined.

The two remaining diagnostic bottle fragments are from a Hazel-Atlas Company canning jar (Fig. 10.16c). The trademark of an "A" contained within an "H", with the words "ATLAS MASON", is visible on the fragments. This trademark was used by the company from 1920-1964 (Toulouse 1971:239).

The identifiable bottle fragments support the 1920's-1930's deposition date for Test Area II.

Flat Glass (n=10)

Thicknesses: 1/10 inch; 1/16 inch

All flat pieces of glass were classified as window glass. Those specimens with thicknesses of 1/10 inch are clear, but have a green tint when viewed obliquely. The specimens 1/16 inch thick are clear.

Drinking Glasses (n=2)

Fragments of two drinking glasses were recovered from Test Area II. One (Fig. 10.16b), a base fragment, has 16 facets and a base diameter of 59 mm. The other, a rim fragment, is from a plain glass of indeterminant diameter.

Glass Pitcher (n=1)

One fragment of a glass pitcher (Fig. 10.16a) was recovered from Test Area II. The pitcher was rectangular with rounded corners. Line patterns decorated the corners. Height and diameter cannot be determined, but the piece expands in thickness from 1/8 inch to 1/4 inch, top to bottom. Stylistically, this specimen can be classified as art deco, which was popular in the 1920's and 1930's.

Ceramics (n=29)

The range of types present in the excavated collection is as diverse as the surface collection. Utilitarian stoneware still dominates the collection (14 specimens), reflecting the extensive use of crockery. Plain, white-glazed ironstone (10 pieces) is the next most common type. This is the ceramic type that is generally the most common on post-1850 sites (Noël Hume 1970). The most notable feature of the ceramic assemblage is the lack of crockery sherds in Test Area II. This is interpreted as evidence that home-production of cheese and other dairy products was no longer as important in the 20th Century farm economy as it was in the late 19th Century.

Some of the high quality wares such as decalware and flow blue are illustrated in Figure 10.15 b, c, and e.

Porcelain Insulator (n=1)

Pieces such as this were common during the early years of electricity. In rural areas, porcelain insulators can still be seen in a functional context.

Wire (n=88)

All of the wire specimens were recovered from Test Area II. The pieces probably represent the decomposed fragments of a few long lengths of wire. All are iron, and although too corroded to measure, represent several different gauges.

Barbed Wire (n=1)

The single specimen of barbed wire recovered from this site came from Test Area II. However, it was in too poor condition to identify.

Tin Cans (n=1)

Diameter: 5 inches (127 mm.); Height: indeterminable.

One tin can was recovered from Test Area II. This is an open top, flange sealed can, which is the most common type of post-1902 container (Fontana and Greenleaf 1962:72-3). It had a diameter greater than its height. The channeling around the rim of the can (Fig. 10.17b) indicates that this is one of the resealable varieties. Generally, such cans were used for grease, paint, varnish, etc. The contents of this can cannot be determined.

Nails (n=62)

Forty-eight square cut nails were recovered from this site. All but one were from Test Area I. The variety of types present include finishing, shingling, framing, and casing. This variety of square cut nails suggests pre-1890 construction in this area. This suggestion is corroborated by the historic record.

Thirteen wire nails were recovered, 11 of which came from Test Area II. The predominance of these modern nails in Test Area II supports the contention that the area was a post-1900 disposal site.

For a more complete discussion of nails from 14BU1003 see Appendix 10.A.

Staples (n=2)

Two 1 inch iron staples were recovered from Test Area I.

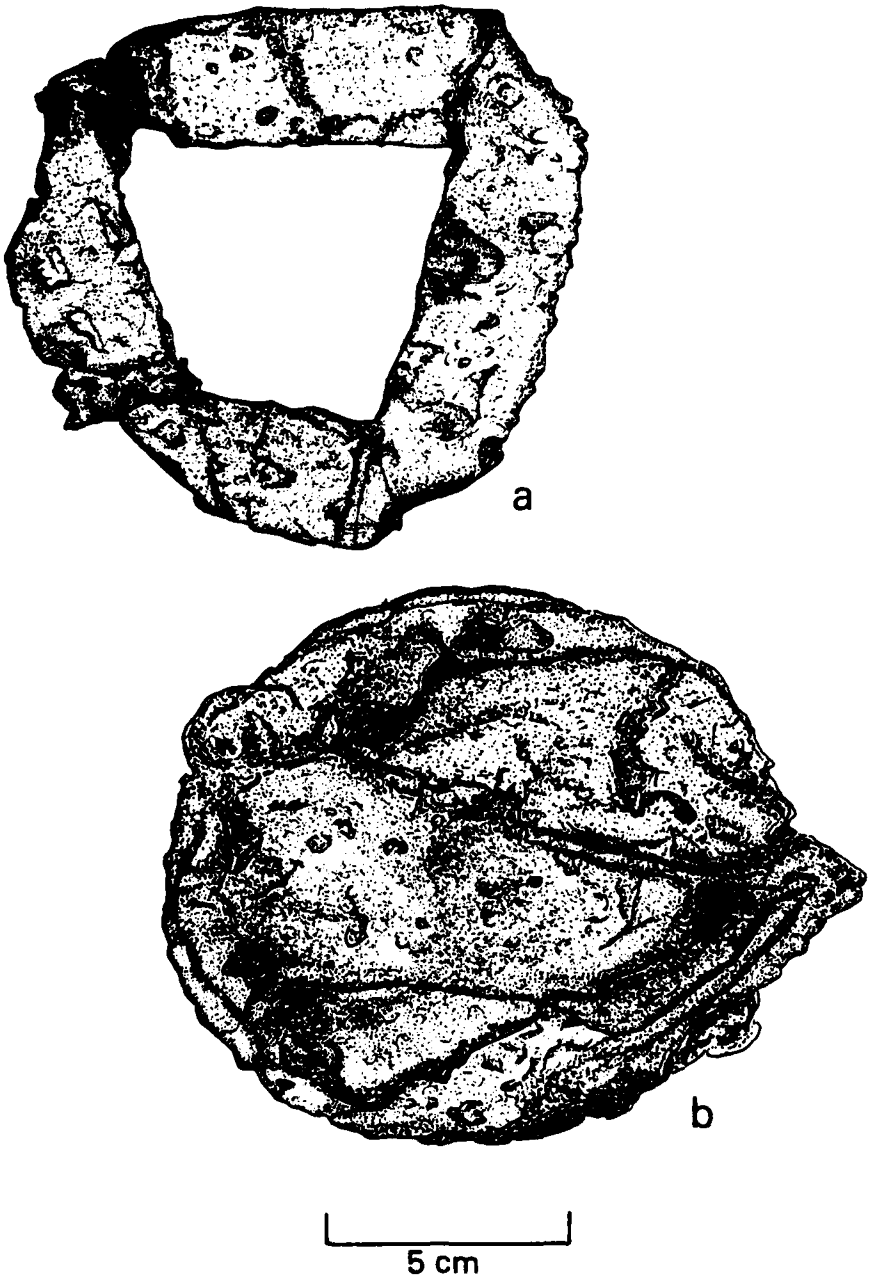

Figure 10.17. Marshall site, 14BU1003, metal artifacts: (a) iron band; (b) open-top, flange sealed can.

Miscellaneous Metal Artifacts (n=9)

Included in this category are: 1) a brass keyhole with two brass rivets (Fig. 10.18e) typical of those found on hutches, cabinets, or small chests; 2) a brass gasket fragment of indeterminant diameter; 3) an example of the universal bottle beverage cap patented in 1891 and still used today (Fig. 10.18c); 4) a broken 3/8 inch hex-headed cap screw; 5) a 5/8 inch (length) copper rivet; 6) a small buckle, possibly from a pair of suspenders (Fig. 10.18d); 7) two zinc jar lids with porcelain liners from Ball mason jars (Fig. 10.18a); and 8) an iron band of indeterminant diameter, 1¼ inch wide, that is possibly a wagon hub band (Fig. 10.17a) (*cf.* Spivey *et al.* 1977, Fig. 52i). The first two are from Test Area I, the latter seven are from Test Area II.

Miscellaneous Metal (n=15)

Fifteen unidentifiable quantities of iron were recovered from this site.

Miscellaneous Non-Metal Artifacts (n=15)

All of the miscellaneous non-metal artifacts are from Test Area II. Included within this class are one fragment of tar paper, three pieces of a phonograph record, eight brick fragments, and three pieces of what appears to be the black rubber cover of an automobile running board or floor mat. These are probably among the latest deposits at this site.

Unworked Stone (n=2)

Two chert chips were recovered from Test Area I. One of the chips has been heat treated. It is discolored and glossy. The chert type is unknown. The other specimen is a Florence chert chip. These chips may be related to the occupation at 14BU4.

Daub (n=2)

Two small pieces of daub were recovered from Test Area I. These may also be related to the occupation at 14BU4.

Bone (n=4)

The only identifiable bones from the Marshall site are three specimens from Test Area II. The three are a mandible fragment, a femur, and a scapula from a domestic cat.

14BU1005 - The Doc Lewellen Site

The Doc Lewellen site, 14BU1005, has three houses present in varying states of preservation. All three were built by Doc Lewellen, one of the area's earliest settlers and a man prominent not only in local history but in the history of Wichita as well. The house that was the focus of the investigation in 1978 was a stone cabin, the second of the three houses built.

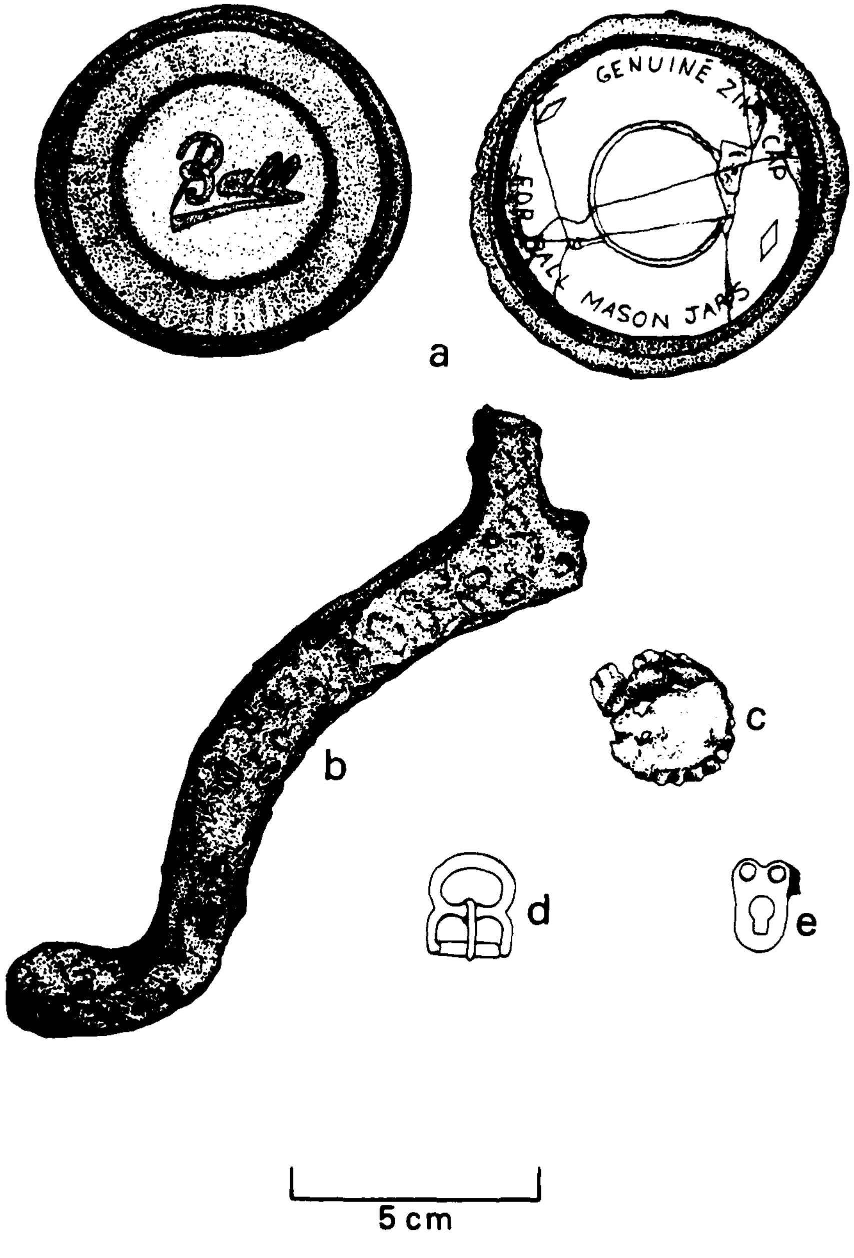

Figure 10.18. Marshall site, 14BU1003, metal artifacts: (a) Ball jar zinc lid with porcelain liner; (b) wagon step; (c) crown cap; (d) buckle; (e) brass key hole.

It was the decision of the historical archaeologist to investigate this site in order to gain an understanding of the construction and layout of a stone house. Additionally, this site is one in which the Butler County Historical Society is interested. There is an active campaign underway to preserve the stone cabin from this site in an historic park. Since one of the primary goals of archaeology is to recreate past lifestyles, the data accumulated through excavation not only benefits archaeological science but also contributes to an accurate reconstruction of the cabin and its associated lifeways. The importance of the site as an historical archaeological and architectural resource, which were the primary considerations that led to its selection for investigation, lay in the fact that documentary evidence indicated it had a short occupation span and had not been seriously altered through the years.

The stone house is situated between the uplands and the floodplain on the east bank of the Walnut River. A natural spring is present due east of the house and flows south and west around it. The south yard of the house shows evidence of considerable water erosion.

During test excavations at the house, the remains of a possibly contemporary bank barn were found. These remains are approximately 100 m. south and east of the house on a rise of ground. This area was designated Test Area II.

History

Doc Lewellen (Fig. 10.19) was one of the first pioneers in Butler County. He and his wife Susannah had moved from the West Virginia-Pennsylvania region to Iowa in 1855. In 1857 they moved to Kansas where he acquired land on the east and west bank of the Walnut River.

The original Lewellen occupation was a log cabin on the west bank of the Walnut River. Lewellen and his wife occupied this cabin until 1868 when he took over a trading post on the Little Arkansas River and became active in the settlement of Wichita.

Two of Lewellen's children died during the occupation of the log cabin. They were buried on a rise northwest of the cabin site. This small cemetery is now designated 14BU38.

Lewellen returned to Butler County in 1873-74. Because of problems such as flooding that had been experienced with the log cabin during the earlier occupation, Lewellen built a stone dwelling on the east bank of the Walnut. The construction of what was apparently considered a high status residence was recorded in the Walnut Valley Times, May 29, 1874.

Flooding once again became a problem and so Lewellen built a 2½ story frame house in the uplands in 1885. He occupied this house until he died in 1901. This house and all of Lewellen's property have passed down through his family line.

Figure 10.19. Doc Lewellen.

Lewellen was a stockman and farmer through most of his life. His farm, which at one time exceeded 1160 acres, denotes his success in these professions.

The stone cabin is situated between the upland prairie and the Walnut's floodplain. Such a location is indicative of the site's importance as an example of the history of the lake area's development: Settlers moving into Butler County were coming primarily from the second American frontier; Indiana, Ohio, Kentucky, Illinois, etc. - all part of the eastern woodlands. When faced with a radically different environment such as the Great Plains, these early settlers apparently tried to minimize the change by selecting for environmental niches similar to those from which they came; i.e., the wooded floodplain of the Walnut River and its tributaries. In time such settlements proved untenable because of the Walnut's tendency to flood. In addition, as agricultural activity increased in fields above the floodplain, run-off also increased and thus created an additional flooding problem. It is precisely these last two reasons that are cited in the Lewellen family oral history as being responsible for the abandonment of the original log cabin.

From the floodplain, settlements were moved to upland prairie or second bottom sites. The abandonment of the floodplain as a zone of occupation can be bracketed between the late 1860's and the 1880's. By the turn of the century nearly all permanently occupied buildings were in the uplands.

The Lewellen houses are representative of this change in the locus of occupation. The original cabin was on the floodplain with fields on the surrounding higher ground. Oral history indicates it was abandoned because of flooding problems. The stone cabin stands on higher ground, second bottoms, but still had fields above it and a spring that flowed around it. There is distinct evidence that this house also experienced periodic flooding. The third house, a large frame structure, stands due east of the stone house in the uplands. According to Joe Lewellen, lifelong resident of the house and a direct descendent of the builder, the third house has never experienced any flooding problems. Thus, it can be seen that this site is highly significant to the historical archaeology of the area as an example of the habitational shifts that the population in the area underwent.

Architecture

The cabin is architecturally significant. Limestone houses were considered a sign of status on the frontier - a fact that remains alive in the area's oral history. Their construction required a degree of skill and was often performed by a specialist. According to the earliest available records (1875), there were 28 active brick or stone masons in Butler County and they averaged a salary of $2.00 to $2.50 per day (State Board of Agriculture 1875:213,539). Thus, a stone house built by a specialist was not cheaply acquired.

The Lewellen cabin is one of only two limestone houses which survive within the boundaries of the lake area. As this type of technology is quickly passing from the American scene, it is important that the few remaining examples be preserved. The other stone cabin that is still standing, 14BU1008, was continuously occupied from 1869 to 1976 and was extensively modified. Since little alteration has been done to the house at 14BU1005, it is the logical candidate for preservation.

The Lewellen cabin was built coursed fashion with cut white limestone blocks. The whiteness of the limestone makes the cabin stand out from other stone structures in the lake area and has been used as evidence to suggest that the stone was imported (Madge Jones, personal communication). An analysis of the limestone reveals that it is of local origin, probably quarried on the Lewellen property (Appendix 10.B).

Although the blocks are coursed, there are two distinct sizes of blocks used. The first four feet of the house were laid using long, narrow blocks averaging 28.6 inches in length and 5.2 inches in width. Above these long, narrow blocks were shorter, wider ones averaging 18.7 inches in length and 7.8 inches in width (Fig. 10.20). The shift in size may have been due to a technological advantage provided by having the long, narrow stones on the bottom thereby better displacing the weight of the succeeding courses. Interviews with stonemasons provided a different explanation for the shift in size. According to the masons, the shift was probably due to the facts that 1) the limestone was deposited in a thin stratum and was thus quarried out in thin blocks; and 2) since the long, narrow blocks are difficult to work with (they tend to break easily), they would be used for the lower

Figure 10.20. Doc Lewellen site, 14BU1005: cut stone house, east facade.

Figure 10.21. North facade.

courses and the blocks from thicker deposits would be used to finish off the structure.

A mixture of lime and sand was used as a mortar. This same mixture was also applied to the interior walls and then plastered over. The chinking was a type of blue limestone which occurs in the El Dorado area and is considered too friable to work with by stonemasons.

The house is oriented with the front door facing east. A length of 32 ft. 2 in. was recorded for the north-south walls and 19 ft. 2 in. for the east-west walls. The north and south walls have two ground floor windows positioned directly opposite each other (Fig. 10.21). Since the prevalent summer winds are out of the south (Leaf 1976:23; Flora 1948; Borchert 1950), the windows would have handled ventilation during the summer months. There are no ground floor windows in either the east or west walls, but there is a small window in each end of the loft.

Stylistically, the house is a vernacular I-house with gabled ends. It probably was a two room structure with a loft. However, the fact that the house is currently being used as a hay barn precluded any analysis of the interior. As there is no evidence of modification in any of the walls, it is assumed that the cabin had a central fireplace. There are a number of dressed stones laying about the perimemter of the house, some showing definite signs of fire darkening. These may have been part of the fireplace. There is also a possibility that there was no fireplace, but a stove instead. The remains of an iron stove were found near the house. Excavating within the house should determine whether a fireplace had been present.

The foundation stones were set 1½ feet below the ground surface, a pattern repeated at other limestone structures in the lake area. The builder's trench was just wide enough to accommodate the foundation stones and for this reason did not appear in the profiles of the test pits. The foundation stones are easily discernible from the other blocks, as they have not been faced on all sides (Fig. 10.22). Thus, three distinct zones of blocks are recognizable: long, narrow, rough, unfaced blocks; an initial above ground level of long, narrow, faced blocks; and short, wide blocks for the bulk of the house.

All of the above ground stones have been faced on all sides. Those stones that form the corners of the house, frame the doorway and windows, and all lintels and sills have been dressed. The dressing consists of horizontal rows of niches in the stone's face, probably produced by one of the finer grades of stone axe. It is suggested that the effect produced by this dressing was an attempt to replicate the essential idea of the quoin corner style popular in the east. Quoin corners, meaning that the blocks which form the corners stand out from the remainder of the blocks, was a common 18th Century device that Lewellen was probably familiar with since he was from the Pennsylvania region. It should also be pointed out that the barn associated with the house was styled after a Pennsylvania bank barn. Therefore, it may not be unreasonable to assume that the house's decorative motif was an attempt to capture the flavor of an eastern style using local materials.

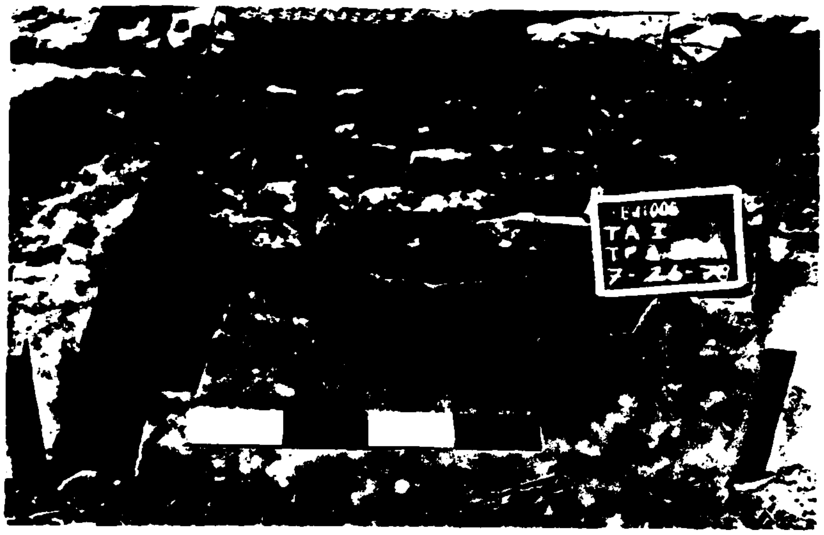

Figure 10.22. Doc Lewellen site, 14BU1005: foundation stones exposed during excavations around the cut stone house.

Figure 10.23. Doc Lewellen site, 14BU1005: test excavations in the east yard of the cut stone house.

It cannot be stated with any degree of certainty who the mason responsible for the Lewellen house was. Local oral history again provides a solution, but one that cannot be substantiated. According to an informant (Madge Jones, personal communication), the stonemason's mark, an AP in a square on the left side of the doorway, stands for Asa Parker, a relative of Lewellen's wife. However, there is no evidence that an Asa Parker ever existed. Nor can a relationship between Lewellen's wife and the Parkers be demonstrated. The mark may be that of Alfred Popkess, who is listed as a stone merchant in the May 11, 1873 edition of the Walnut Valley Times. Future research should be directed towards identifying the various stonemasons who worked in the area so that determinations may be made as to influences and continuities in style such as that proposed above.

Currently the cabin has a sheetmetal roof. Thirteen common square cut nails recovered during excavation are of the size used for shingling (4d), thus suggesting the house originally had a shingle roof (Appendix 10.A). A cedar shingle roof was the most common type of the 19th Century and thus was the type most likely present.

It is believed that a porch was present on the east side of the house. A limestone cobble layer overlain by a jasper and chert layer was deposited in front of the porch. There is no evidence for any sort of structure having been attached to the east wall but there are large, flat pieces of limestone positioned at each corner and on either side of the doorway (Fig. 10.23). These could be foundation or footing stones for a free standing porch positioned directly against the east wall.

The porch and cobble layer were probably constructed to combat the problem of standing water. An interview with Joe Lewellen, the last owner of this property, revealed that the house is flooded every year with runoff from the surrounding fields. At times as much as 6 inches of water will stand in the house. Such flooding was probably responsible for the porch and cobbled area and eventually for the abandonment of the house.

Further evidence for a porch was provided by the analysis of the nails recovered during excavation (Appendix 10.A). A total of 29 common square cut and wire nails of the type used for flooring, 8d, were recovered. Since these were recovered outside of the house, it is presumed that they were associated with a porch. This presumption is justified in part by the testimony of an informant, who without knowledge of the archaeological evidence, reported that when she visited the house at the turn of the century there was a porch.

It is significant to note the mixture of flooring nails recovered from the site. This combination of square cut and wire nails suggests a time in the late 1880's for construction. Taking into consideration the fact that the frame house was built in 1885, it would appear that the Lewellen's did not occupy the stone house very long after periodic flooding became a problem.

Southeast of the house, on the other side of the spring fed creek, are the remains of a bank Pennsylvania-German barn (Glassie 1968:55). Although there is no documentary proof, it is assumed that the barn was associated

with the stone house. According to the last owner, this barn burned around the turn of the century. There was no rebuilding after its destruction. After it burned, stone blocks were robbed out of its foundation and used to construct stone fences as well as for other purposes.

From the stones that are still in place, it can be determined that the structure had an exterior length of 56 feet along the east-west wall and 35 ft. 9 in. along the north-south wall. The wall averaged 2 feet in thickness.

Removal of the wall stones prevents an accurate reconstruction, but it can be stated with certainty that a 3 foot wide door was present in the southwest corner. It is assumed that a comparable door was present in the northwest corner and that a large double door was in the middle of the west wall. At least one entrance would have been present in the bank wall, the east wall, where one could enter the loft.

It is most likely that only the foundation of the barn was stone. The superstructure was probably wood. Because stones have been removed, it is difficult to state with certainty how high the foundation was. An estimate of at least 6 feet would not be unreasonable.

The barn was constructed in broken course fashion. There is no single size of block present, but most are larger than those in the house.

The apparently intense heat of the fire followed by exposure to the elements has destroyed the faces of many blocks. From what is visible, it appears that unlike the house, most of the blocks used to construct the barn were dressed. However, there is no one particular style of dressing as was the case with the house. Rather, there are at least three distinct patterns present. This variety of stone dressing may reflect the presence of more than one stone mason or it could be the work of a single, inexperienced mason. The latter possibility suggests that Lewellen, himself, may have done the job. Stone masons reported that it was not unusual for a farmer to help or finish a job himself and this resulted in a mixture of finishing styles.

The barn had been built by cutting into a limestone bank. The foundation stones were set directly on the limestone floor (Fig. 10.24). An analysis of the limestone in the floor and walls (Appendix 10.B) revealed that they were virtually identical. Thus, this barn is a remarkable example of the maximal use of the environment: a bank barn was built by cutting into a limestone outcropping; the quarrying activity produced a level stone floor for the barn; the limestone that was quarried to produce the embankment was cut into blocks and used to build the foundation for the barn.

The limestone analysis also revealed that the limestone from the cabin was very similar to that in the barn (Appendix 10.B). The sequence may have been that initially limestone was quarried from the spot the barn now occupies in order to build the house. Later the barn was built, probably requiring additional downcutting to produce a suitable embankment. This would explain the slight variation between the house limestone and that in

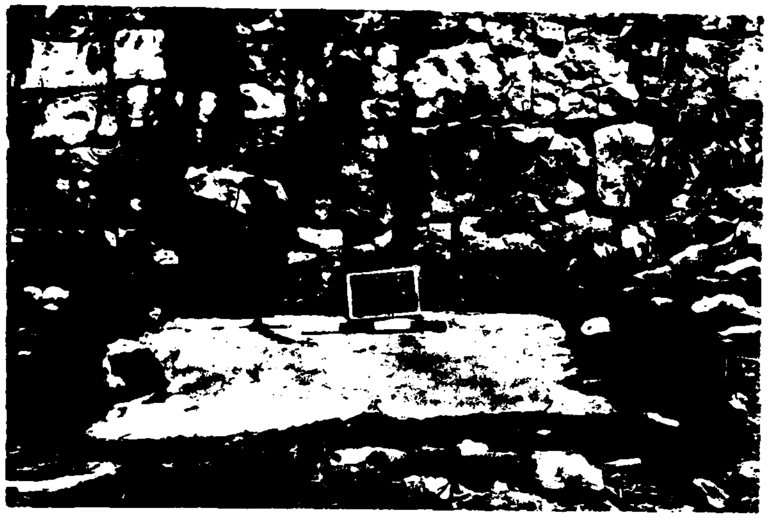

Figure 10.24. Doc Lewellen site, 14BU1005: barn foundation stones resting on barn floor.

Figure 10.25. Doc Lewellen site, 14BU1005: limestone bank barn foundation as it appeared in 1978.

the barn - the house limestone would have come from the upper part of the deposit. Since the two activities would have taken place at different times this would also explain the differences in building styles. It should be noted, however, that the house and barn could have been built simultaneously by different masons and this would also explain the difference in building styles.

Excavations

Test excavating 14BU1005 was accomplished with two test areas. Test Area I was the stone house. Test Area II was the bank barn believed contemporary with the house (Fig. 10.25).

Excavations in Test Area I were initiated with a trench 6 m. long and 1 m. wide, comprising Test Pits 1 to 6, along the east wall of the house (Fig. 10.26). Excavators encountered 5 cm. of a very fine, gray silt in the first level. Below this was a yellow clay which continued through the other levels to the point where excavation was terminated at 50 cm. below the surface.

No evidence for a builder's trench was uncovered by the test pits. Four probable footing stones that had been buried in the silt were exposed. No cultural material was recovered from a depth greater than 10 cm. below the surface. Only one test pit was taken down to a depth of 50 cm. below the surface and this was done only to expose the foundation.

As the excavation extended eastward, the limestone cobble layer was encountered at approximately 2 cm. below the surface, 1.6 m. from the east wall. A thin chert and jasper level overlay, or more accurately, intermingled with the limestone cobbles. Below the cobbles was a 5 cm. deposit of gray silt, then the yellow clay. The cobbled area was disturbed along the eastern side. This may indicate that the cobbles did not cover the entire yard.

Test Pits 7 and 8, which were on the north side of the house, revealed that the chert and jasper cobble layer extended along this exterior wall. There were no limestone cobbles. In these pits, the cobble layer was approximately 10 cm. thick. It was overlain by 5 cm. of silt and beneath it was an additional 5 cm. of silt.

The presence of silt in the areas where test pits were opened is related to the placement of the pits. All excavation around the house was on the east and north sides. The silt was deposited by water flowing south from the surrounding fields. The stone wall around the east yard and the house, itself, acted as barriers trapping the silt as the water flowed through. Thus, on the north and south sides of the house there is silt accumulation, while on the south side, the ground has experienced considerable water erosion.

Six units were opened in Test Area II (Fig. 10.27). The accumulation of debris along the east wall prevented any pits being placed in that area.

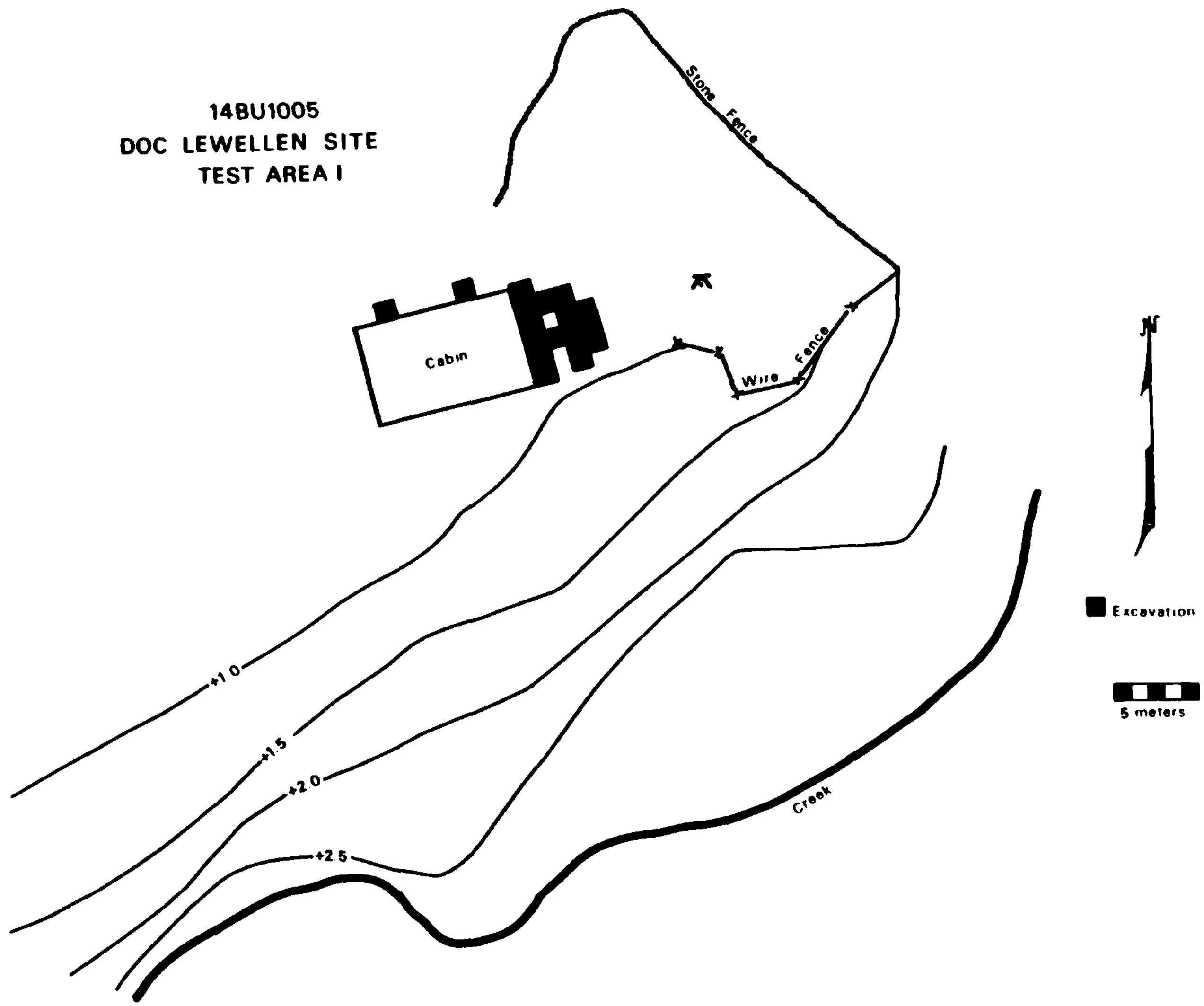

Figure 10.26. Doc Lewellen site, 14BU1005: plan of excavations in Test Area I.

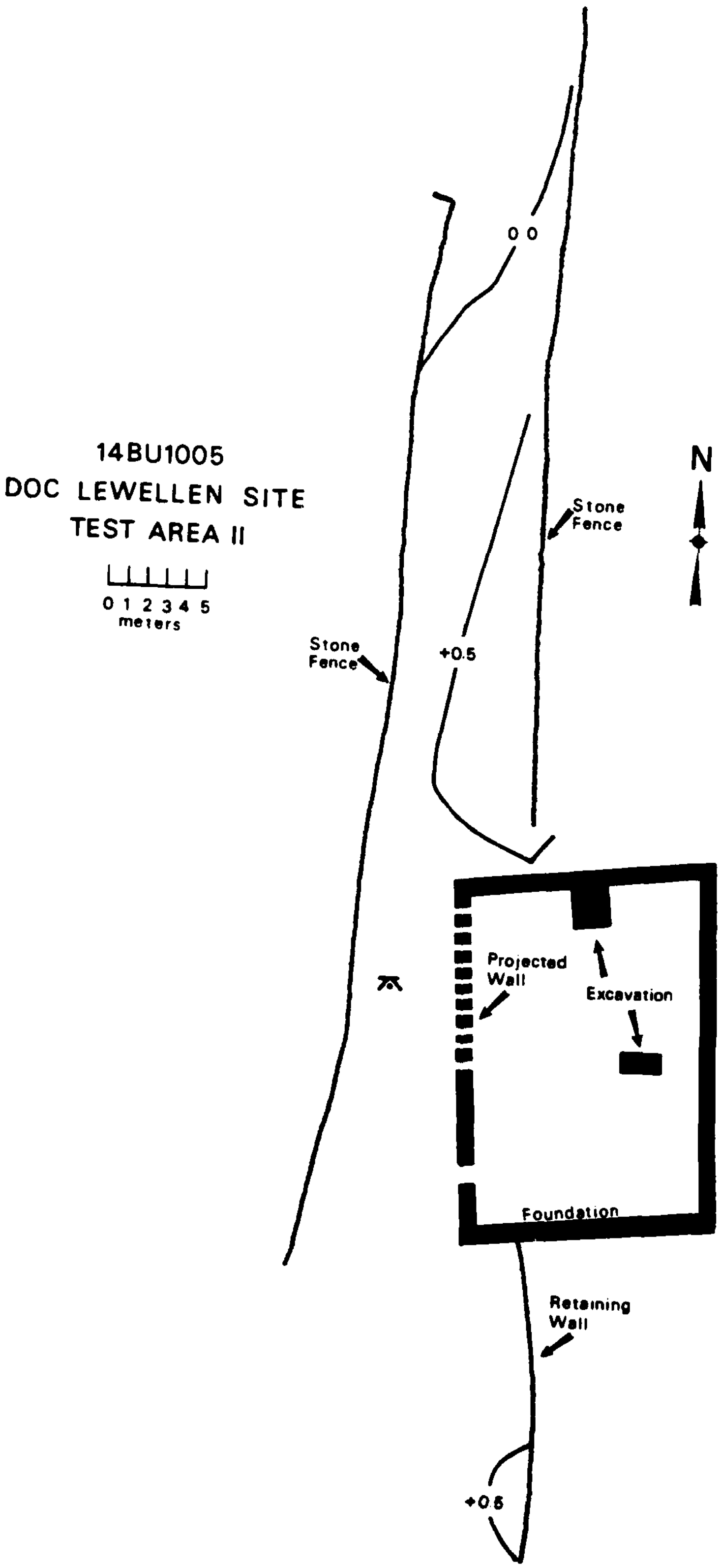

Figure 10.27. Doc Lewellen site, 14BU1005: plan of excavations in Test Area II.

All pits were restricted to the interior of the barn. Two contiguous 1 by 1 m. units, Test Pits 10 and 11 were placed in the center of the barn. Four contiguous units, Test Pits 12 to 15, were placed at the center of the north wall.

The soil was a gray loess deposit. Because of the predominant southerly winds, the limestone floor was 30 cm. below the surface in the pits along the north wall, while only 10 cm. below the surface for the center pits. There was less than 5 cm. difference between the elevations of the two portions of exposed floor.

The majority of the artifacts recovered from Test Area II came from the loess deposit. Only a single screw was recovered from the limestone floor. Few of these artifacts showed evidence of having been exposed to intense heat. There were no ash levels or other evidence of a burned structure except the heat crazed walls and floor. The archaeological evidence or the lack thereof, suggests that subsequent to its burning, all the debris from the fire was removed. This may have been so that the area could be used for some purpose. As to what, if any, activity was carried out on the barn site after the structure's destruction, the archaeological and historical records are silent.

Artifacts

The assemblages from 14BU1005 presented in Tables 10.5 and 10.6, are diverse. A greater variety and abundance of material was recovered from the house site than the barn. The degree of overlap between the two areas is attributable to the house having been used as a barn for a while after the Lewellen family had ceased occupying it.

The most important aspect of the assemblages is that ceramics seem to distinguish between the house and the barn. Two pieces of crockery constitute the entire ceramic sample from the barn. It will be seen that the barn at 14BU1006 also has few ceramic artifacts. This suggests that the quantity of ceramics may be a key trait in identifying habitational and barn sites excavated in the future.

Surface Collection (n=65)

The surface assemblage (Table 10.5) was collected around the house site only. Ceramics, particularly crockery (stoneware and earthenware), dominate the collection. Most of the sherds, based on the size of the rims, appear to be from large containers (Fig. 28a-e), including one with a stenciled "3", meaning, "3 gallons" (Fig. 10.29b).

A large number of the sherds were recovered from the stream bed. Most appear to have been made from a fine quality clay. They also exhibit a bristol glaze that is superior to the other glazes in the assemblage. The high quality clay and glaze suggest an origin in Illinois or Indiana, where the better potteries of the late 19th Century were located. Two articulated sherds (Fig. 10.29a) bear the maple leaf trademark of the Western Stoneware

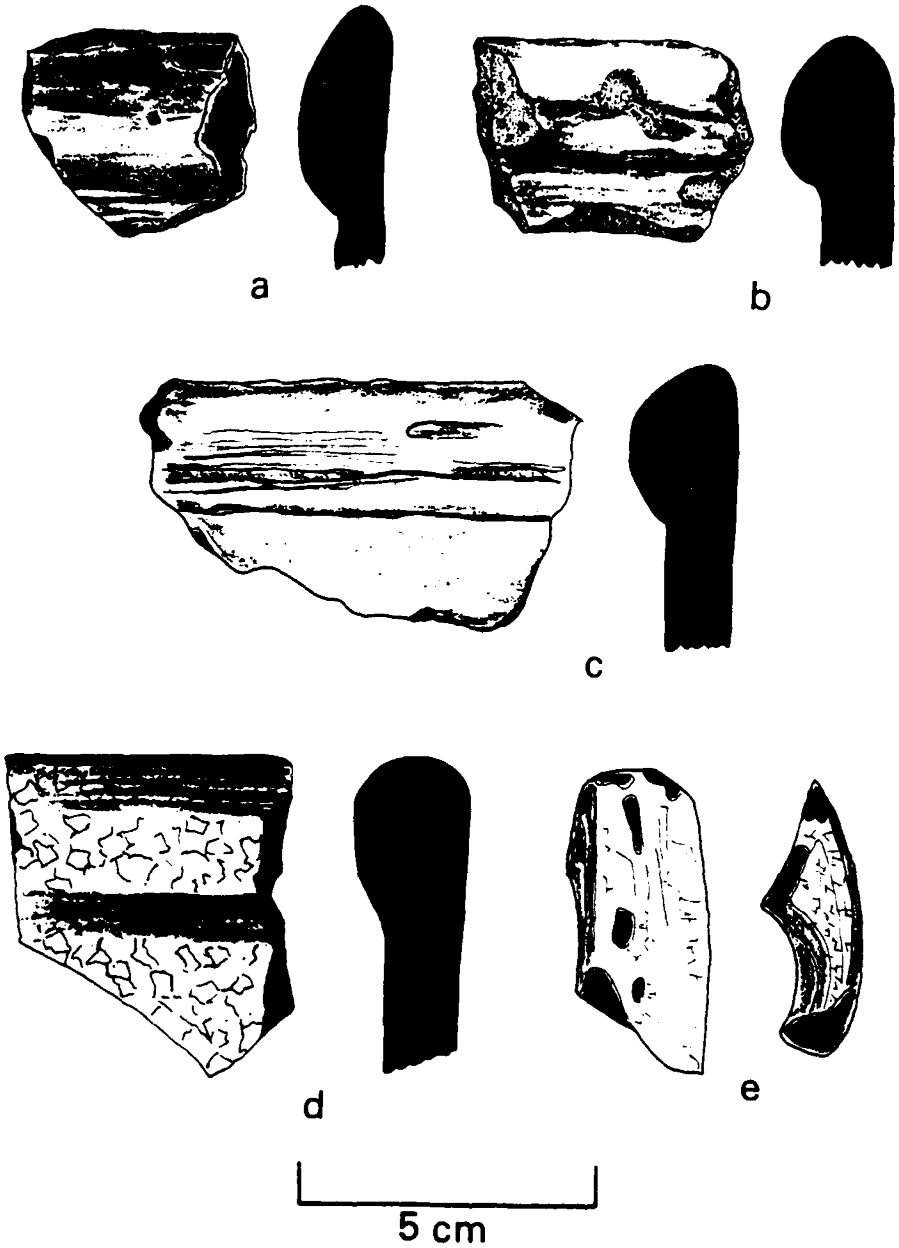

Figure 10.28. Doc Lewellen site, 14BU1005, ceramics: (a-d) stoneware rim sherds; (e) ceramic handle.

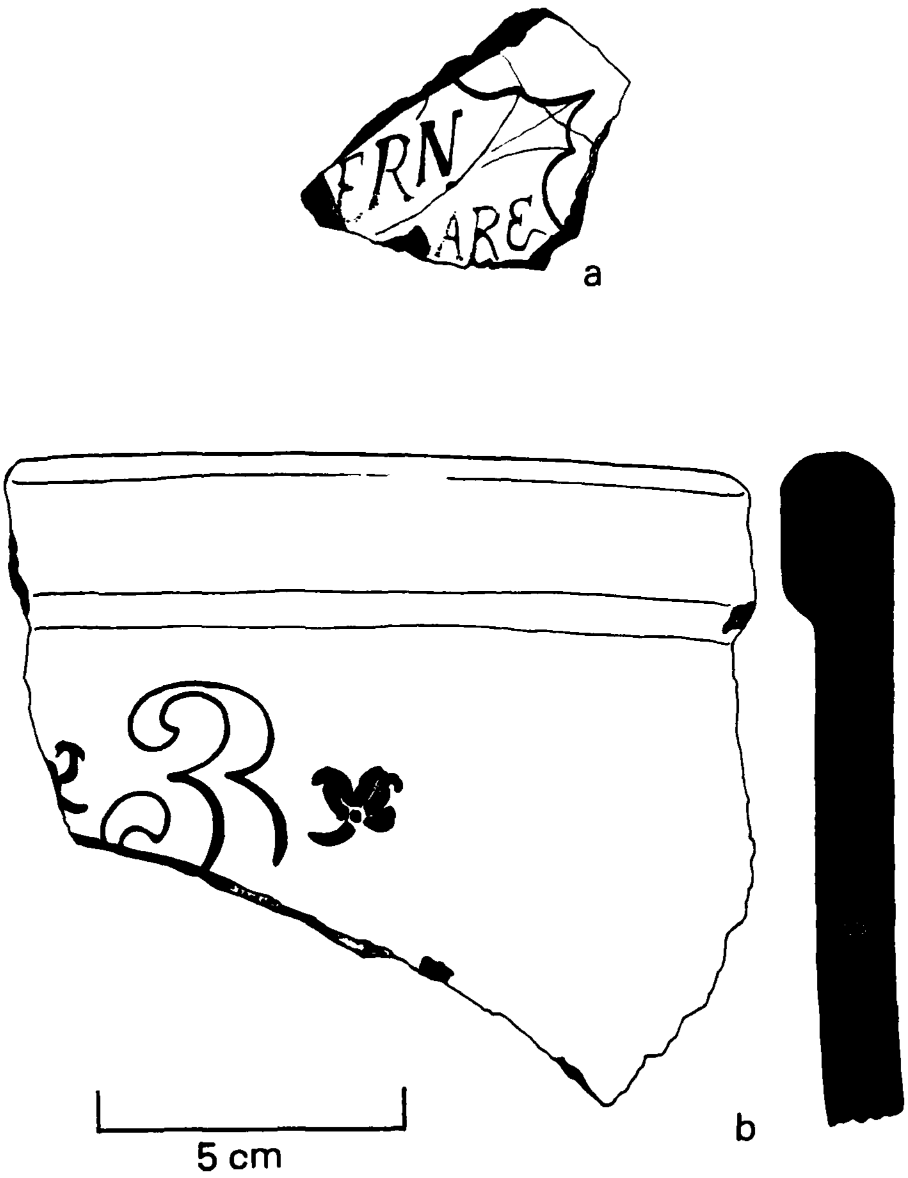

Figure 10.29. Doc Lewellen site, 14BU1005, marked ceramics: (a) Western Stoneware Company sherd; (b) three gallon crock shred.

Table 10.5. 14BU1005, Surface Collection.

TYPE	NUMBER OF SPECIMENS	TYPE	NUMBER OF SPECIMENS
BOTTLE GLASS			
Amber	5	DOOR HINGE	1
Aqua	5		
Clear	4	HINGE/LID	1
Green	2		
Manganese	3	LATCH	2
Yellow	1		
		METAL BAR	1
EARTHENWARE			
Albany/Dull Brown	1	BOLT	2
STONEWARE		BRACKET	1
Albany/Albany	1		
Black/Black	1	METAL CAP	1
Bristol/Bristol	13		
Bristol/Unglazed	2	SPROCKET	1
Dark Red/Dark Red	1		
Gray/Albany	1	MOWER BLADE	1
Gray Salt/Black	1		
Tan/Albany	2	HOOK	1
WHITE GLAZED IRONSTONE	3	MISC. METAL	1
WHITE GLAZED CHINA	6	BOVIDAE TOOTH	1

Company. Western produced stoneware in Monmouth, Illinois between 1870 and 1890. Thus, the proposed midwestern origin for most of these sherds may be factual. Additionally, the Western sherd tends to suggest that the crockery was associated with the stone house occupation (1874-1885) and not a later time.

Bottle Glass (n=100)

Four specimens, including one intact bottle, are chronologically significant. Using seam height as a criterion, two bottle necks and the complete specimen, all from Test Area 1, can be dated between 1880 and 1900 (Fig. 10.30 a and e). All may have been medicine bottles.

The complete bottle (Fig. 10.30a) is round with a height of 2 inches (50 mm.) and an orifice interior diameter of 3/4 inches (19 mm.). It was made from clear glass. On the bottom is the maker's mark: W. T. CO. on the radius with D in the center. This may represent the Whitall-Tatum Company of Millville, New Jersey, a bottle producer from 1857-1935. They

Table 10.6. Excavated Artifacts, 14BU1005.

TEST PIT	1	2	3	4	5	6	7	8	9	10	11	12
BOTTLE GLASS												
Amber							1/12%					
Aqua												
Clear		1/2%			3/5%	2/3%		1/2%		2/3%		4/6%
Green		1/25%	1/25%	1/25%	1/25%							
Manganese							1/100%					
Milk		1/5%										1/5%
FLAT GLASS												
Clear		1/6%			4/22%	5/28%	2/11%					
GLASS BEAD			1/50%									
WHITE GLAZED IRONSTONE	2/11%		1/6%	1/6%	2/11%		1/6%					
WHITE GLAZED CHINA					2/67%							
STONEWARE												
Albany/Albany												
Albany/Bristol		1/100%										
Bristol/Albany			1/100%									
Brown/Tan			1/100%									
Tan/Tan					1/33%	2/67%						
Yellow/Albany					1/100%							
Yellow/Yellow			1/100%									
White/White						1/50%	1/50%					

Table 10.6. (Continued).

TEST PIT	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
BOTTLE GLASS													
Amber		1/12%	1/12%	1/12%	1/12%			1/12%				2/25%	8
Aqua							1/25%		1/25%			2/50%	4
Clear	24/38%	2/3%	1/2%	1/2%	1/2%	4/6%	1/2%			3/5%	5/8%	8/13%	63
Green													4
Manganese													1
Milk	1/5%	15/75%	1/5%					1/5%					20
FLAT GLASS													
Clear	1/6%				3/17%	2/11%							18
GLASS BEAD	1/50%												2
WHITE GLAZED IRONSTONE					1/6%		2/11%	2/11%		1/6%	3/17%	2/11%	18
WHITE GLAZED CHINA												1/33%	3
STONEWARE													
Albany/Albany	1/33%	1/33%										1/33%	3
Albany/Bristol													1
Bristol/Albany													1
Brown/Tan													1
Tan/Tan													3
Yellow/Albany													1
Yellow/Yellow													1
White/White													2

Table 10.6. (Continued).

TEST PIT	1	2	3	4	5	6	7	8	9	10	11	12
WIRE	1/1%	1/1%		2/2%	6/6%	7/7%	4/4%	2/2%		11/10%	3/3%	5/5%
BARBED WIRE						1/20%				2/40%		
TIN CAN								1/100%				
STAPLES		1/33%				1/33%						
WAGON AND HARNESS PARTS	1/20%				3/60%							
MISC. METAL ARTIFACTS					1/7%		2/14%			1/7%	1/7%	2/14%
MISC. METAL	1/3%					1/3%				2/6%		3/9%
MISC. NON-METAL ARTIFACTS		1/14%				1/14%	2/28%					1/14%
BONE	1/33%				1/33%				1/33%			

Table 10.6. (Continued).

TEST PIT	13	14	15	16	17	18	19	20	21	22	23	24	TOTAL
WIRE	39/38%	4/4%	3/3%	2/2%	1/1%						4/4%	9/9%	104
BARBED WIRE	1/20%										1/20%		5
TIN CAN													1
STAPLES												1/33%	3
WAGON AND HARNESS PARTS											1/20%		5
MISC. METAL ARTIFACTS	1/7%	1/7%	1/7%		1/7%	1/7%			1/7%	1/7%			14
MISC. METAL	3/9%	3/9%					2/6%				18/51%	2/6%	35
MISC. NON-METAL ARTIFACTS				1/14%								1/14%	7
BONE													3

were major manufacturers of medicine bottles (Toulouse 1971:544-6).

Test Area II produced a fragment from the subrectangular base of a clear glass bottle. It bears a maker's mark of an "I" in a horizontal diamond with an "O" beneath it (Fig. 10.30b). This mark may be related to the Illinois or Owens-Illinois Glass Companies (cf. Toulouse 1971:264, 403).

Three other bottle fragments, all from Test Area II, have marks that are unidentifiable (Fig. 10.30c,f,g): one a milk glass jar fragment with BAKE- (in script) and the other a clear glass fragment with -N.J. -IC. The latter was probably produced in New Jersey. The third piece is from the body of the bottle and has the letters -CH- embossed on it. These probably identified the product or the product's manufacturer.

Five of the pieces classified as bottle fragments are pressed glass (Fig. 10.30d,h,i). These specimens are probably from bowls, vases, or other containers aside from bottles. However, the fragments are too small to make a determination of function and so they are classified as bottle fragments.

Three of the pressed glass pieces (Fig. 10.30i) have a design that imitates cut glass. These specimens have a high manganese content which gives them a purplish hue and indicates a pre-1910 origin.

The two other fragments are clear glass. One (Fig. 10.30h) has a floral design on it.

The quantity of bottle glass recovered from Test Area II primarily came from a concentrated area of debris in Test Pit 13. The density of material suggests a single deposition.

Flat Glass (n=18)

Thickness: 1/10 inch (2 mm.)

Except for one fragment, all flat glass was recovered from Test Area I. The most noteworthy aspect of the flat glass assemblage, is that none of the specimens were recovered from pits near windows.

Glass Beads (n=2)

Two green glass, tubular beads, one from each test area, were recovered. Each has a diameter of 3/8 inches (5 mm.). Both are broken. Neither has been tumbled.

Wire (n=104)

This is the largest class of artifacts. Most were recovered from Test Area II. As has been seen at other sites, most of the specimens probably represent the decomposed fragments of longer lengths of wire. There are several gauges represented but all the specimens are too corroded to accurately measure. All the specimens are iron except two pieces of lead wire.

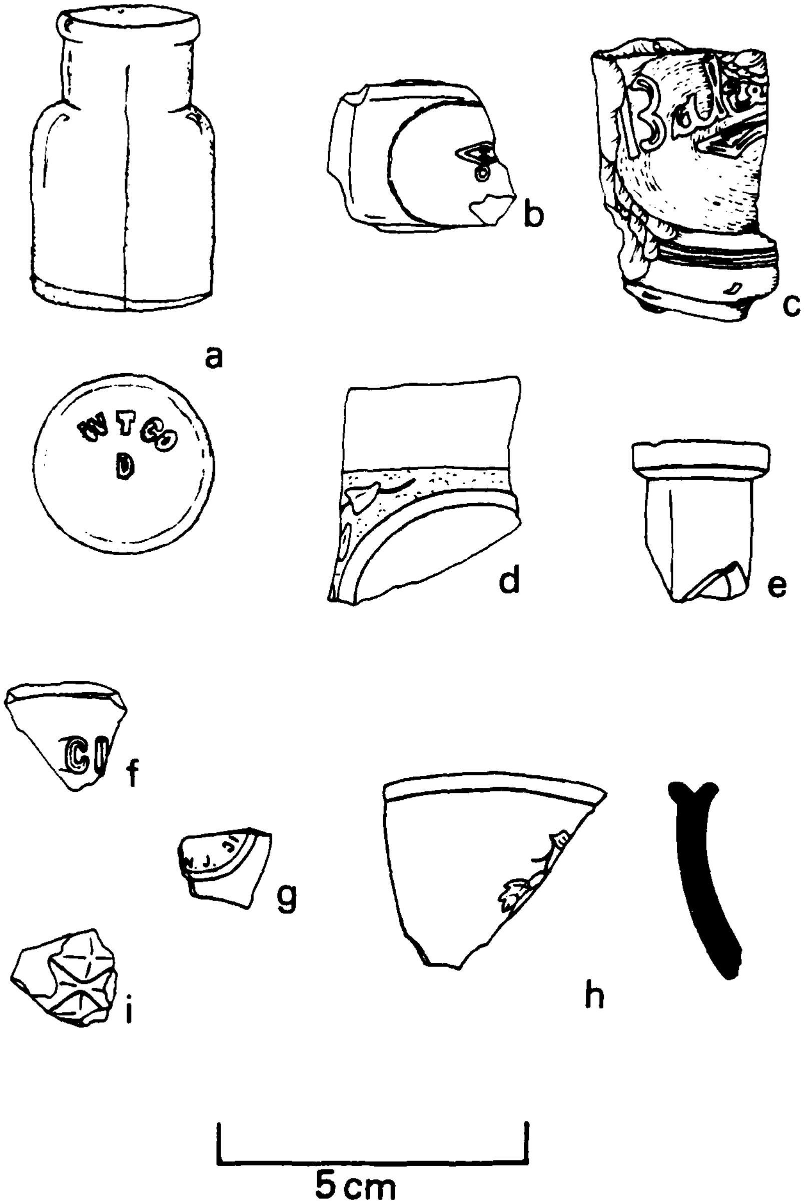

Figure 10.30. Doc Lewellen site, 14BU1005, glass artifacts: (a) possible medicine bottle ca. 1880-1900; (b) subrectangular bottle base fragment with maker's mark; (c) milk glass jar fragment; (d-i) pressed glass; (e) bottle neck ca. 1880-1900; (f,g) bottle fragments.

Barbed Wire (n=5)

Only one specimen is identifiable. It is an example of Brotherton 2 strand, patented in 1878, from Test Area II. Three pieces from Test Area I are an unidentifiable type of round single line with a two point barb.

Tin Can (n=1)

The single specimen (Fig. 10.31a) came from Test Pit 8. It was below the chert and jasper cobble layer. It has a diameter of 2½ inches and a height of 4 inches. Visible in the lid are the triangular punctures of a can opener. It is an open top, flange sealed can. This type of can has been available since the early 19th Century but became the dominant variety after 1902 (Fontana and Greenleaf 1962:72-3).

Nails (n=98)

A total of 98 nails were recovered from 14BU1005. Nine specimens, four square cut and five wire, came from the barn, Test Area II. The remainder were associated with the house.

The mixture of types and varieties of nails from Test Area I support the contention that a porch built in the 1880's was probably present. Additionally, they indicate that a shingle roof had been put on the building before 1890. The lack of modern shingling nails indicates that the original roof had been retained until it was replaced by the sheetmetal roof now present.

All the nails recovered from Test Area II came from the fill. Because of this, no interpretation can be made.

Appendix 10.A contains a complete discussion of the nails from 14BU1005.

Staples (n=3)

One specimen is a 1 3/8 inch staple. The others are broken. All are iron.

Wagon and Harness Parts (n=5)

Included in this category is one wagon part, a broken wagon box strap bolt (Fig. 10.32b). The other four specimens are harness parts (Fig. 10.32 a-c,e): 1 3/8 inch tear-drop loop from a bridle, 2½ inch latch from a bridle, a "broken bit" (so named because of the break in the bit), and a portion of a harness chain with a 1 7/16 inch ring and 1½ inch links. All five artifacts are from Test Area I which supports an informant's report that the house had been used as a horse barn.

Miscellaneous Metal Artifacts (n=14)

Specimens in this class were recovered from both test areas. Included are: ½ inch by 5 inch Philadelphia carriage bolt, ½ inch by 2 inch carriage

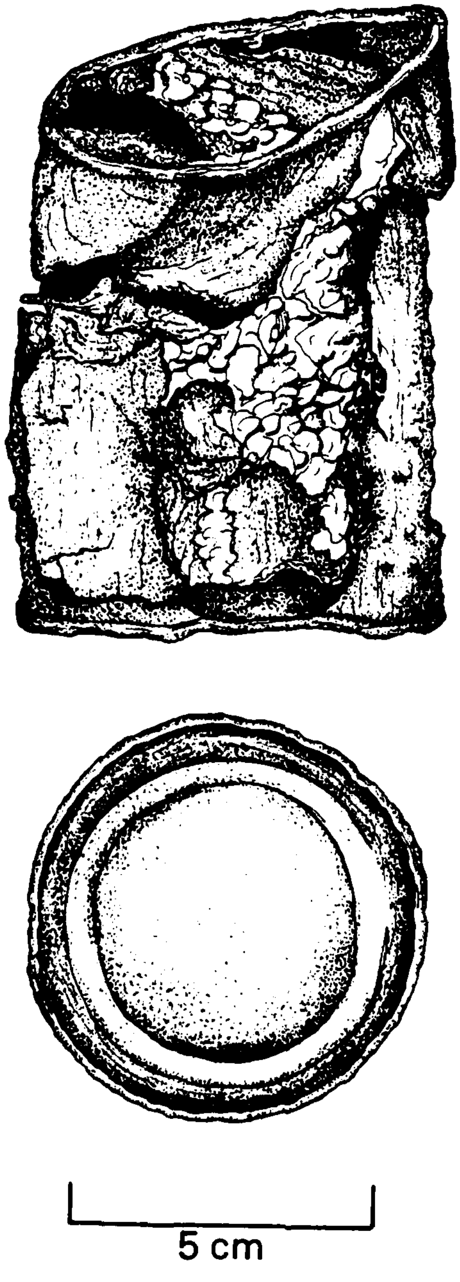

Figure 10.31. Doc Lewellen site, 14BU1005, open-top flange sealed can.

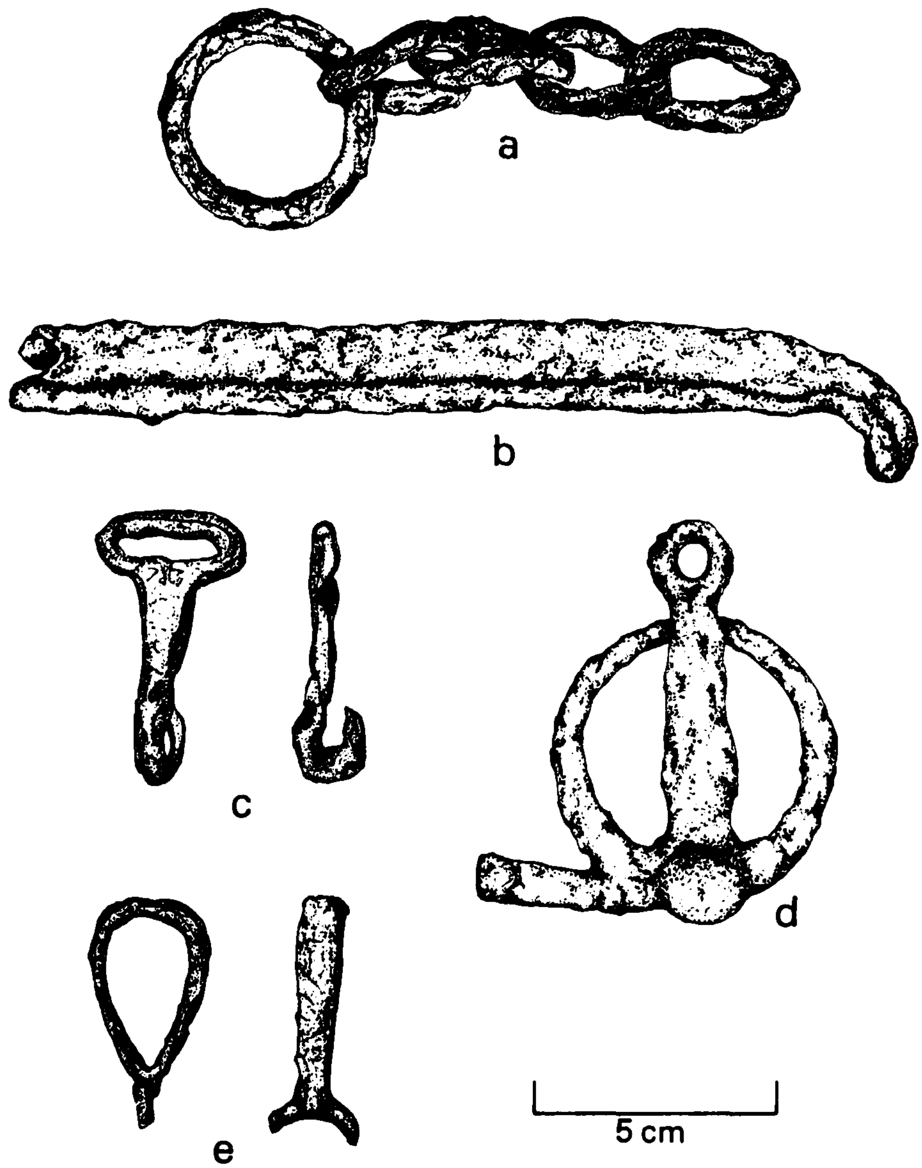

Figure 10.32. Doc Lewellen site, 14BU1005, wagon and harness parts: (a) chain; (b) wagon box strap bolt fragment; (c) bridle latch; (d) broken bit; (e) bridle loop.

bolt, ½ inch by 5 inch square headed cap screw with a hex nut, five sheet metal screws (all from Test Area II), one copper rivet, one iron rivet, a 12 inch by 6 inch iron plate with copper rivets that was possibly part of a seat, two iron machine parts, and a washer fragment.

Miscellaneous Metal (n=35)

All but one of these pieces are unidentifiable iron fragments. The exception is an 8 gm. piece of lead from Test Pit 13.

Miscellaneous Non-Metal Artifacts (n=7)

Included in this class are three pieces of slate, possibly from a slate board, and a slate pencil fragment. These may have been used by Lewellen's children. If so, these are the only child related artifacts recovered from any of the sites.

A rubber stopper was recovered in association with the quantity of broken bottle glass in Test Area II. No bottle neck fragments were large enough to permit comparison, but this may have been the stopper for one of the bottles.

The other two artifacts in this class are a modern, red plastic spray nozzle and a modern rubber shoe heel.

Bone (n=3)

The bone assemblage is comprised of the right tibia of a squirrel, a bird skull (species unknown) and an unidentifiable bone.

14BU1006 - The Kobel Site

The Kobel site, 14BU1006, is located on a high rise of ground in the prairie uplands east of the Walnut River immediately north of the dam. It is difficult to make any assessment of the surrounding terrain as it has been considerably altered by construction activity. When the area was in a pristine state, the inhabitants probably had a clear overview of the surrounding land. The site's barn stood on the highest rise and though only the lower part is still standing, it is still prominent on the horizon (Fig. 10.33).

Visible at the site is the limestone foundation of a Pennsylvania-German bank barn, the rubble from a ca. 1915 frame house with an associated cement constructed root cellar, and a depression west of the barn that supposedly represents the location of the original log cabin. Less than 50 m. from the barn foundation is the edge of the borrow pit from which earth is being removed to build the dam. The borrow pit forms the west and north boundaries of the site. Since the west boundary is less than 10 m. from the log cabin depression, any further encroachment by the pit would be disastrous to the archaeological deposits.

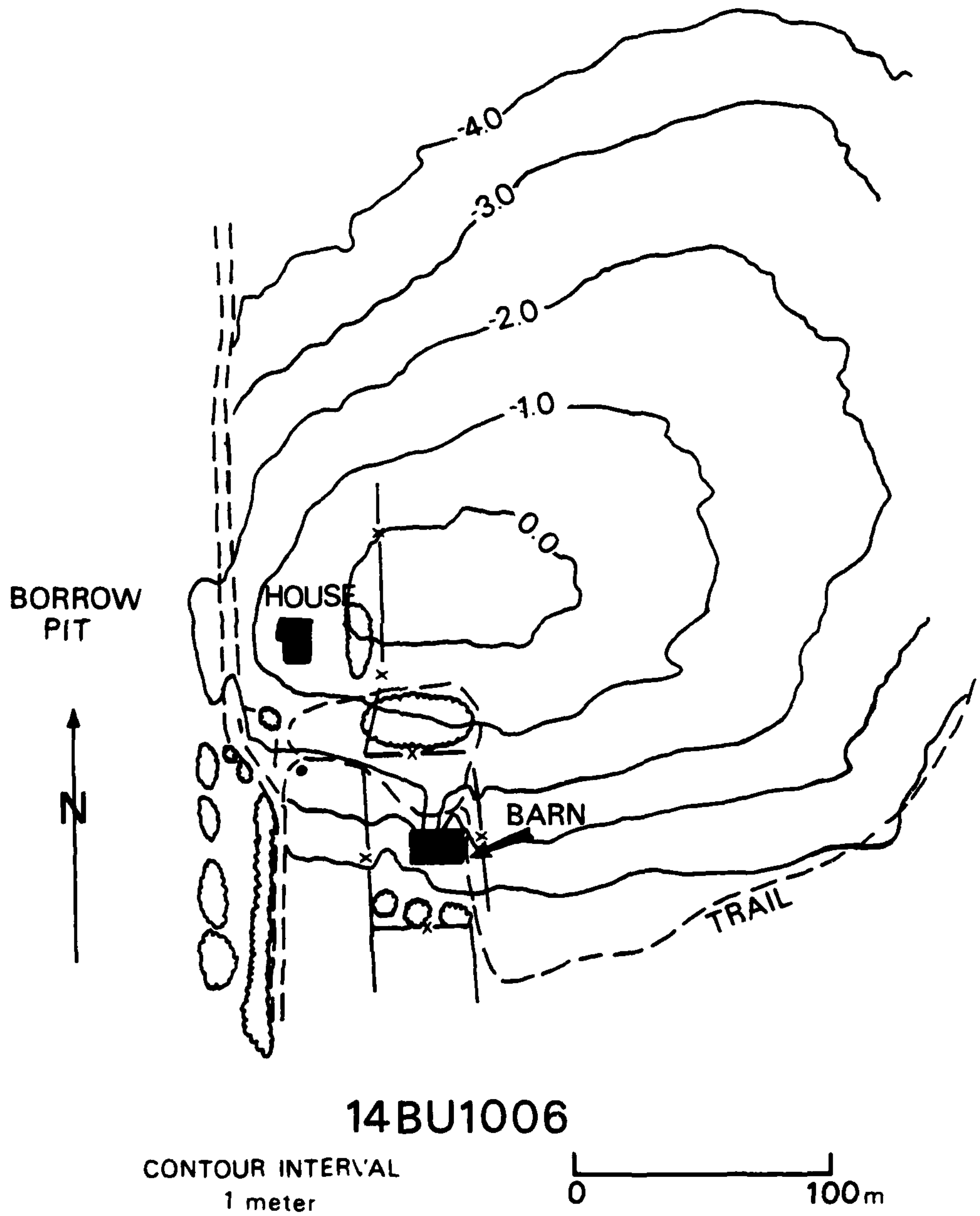

Figure 10.33. Kobel site, 14BU1006: site map.

This site had been selected for testing prior to the discovery and testing of the bank barn at the Lewellen site, 14BU1005. It was decided to follow through with the testing of this site for two reasons: 1) at the time, the documentary evidence indicated that this was the oldest structure still standing in the lake area; and 2) this site provided the opportunity to obtain valuable comparative data on the construction of bank barns.

History

The barn and log cabin are shown on both the 1885 and 1905 county atlases (McGinnis and Thomas 1885; Standard Atlas 1905). Local informants maintained that the barn had been built in 1869, thus making it and the Donaldson house, 14BU1008, the oldest standing structures within the lake area. However, the barn was built by the homesteader, William Bailey, from Union County, Ohio, who did not arrive in Butler County until 1871. Therefore, this structure could not have been built before 1871.

Bailey owned the property until ca. 1900 when it passed into the possession of H. H. Kobel, his son-in-law. The property remained in the Kobel family and was occupied by H. H. Kobel or one of his descendants until the U. S. Army Corps of Engineers took possession of it.

Bailey's original log cabin was occupied until the frame house was built in 1915. The cabin was never occupied again after that, according to informants, although it was used as a storehouse. Frank Kobel, son of H. H. Kobel, attempted to move the cabin for further use at another site by dragging it with two tractors. During the attempt, which occurred during the last 20-30 years according to Frank's son, the cabin was twisted and irreparably damaged. After the unsuccessful attempt to move it, the building was torn down.

The location and date of the original farmstead buildings is significant at this site. This was a homestead of the 1870's. During that time it appears that the original settlements of the 1850's and 1860's in the bottoms or floodplains were being abandoned in favor of occupations on higher ground. This migration was demonstrated at the Doc Lewellen site, 14BU1005. It is suggested that the increasing knowledge of the local environment which prompted the original lowland settlers to move was passed along to later arrivals thus resulting in a marked decrease in lowland settlements after the initial period in the late 1850's and early 1860's. However, it is noted that settlements in the uplands may have increased because land in the floodplains, which, because of its richness was the most desirable, was no longer available. It is at this point that the Kobel site becomes significant.

William Bailey came to Butler County from Ohio, part of the second American frontier. Therefore, he was familiar with a woodland environment just as the first settlers had been. The earliest settlers from similar environments had tried to replicate them by settling in the lowlands which were the only wooded areas in the county. The land Bailey homesteaded included wooded portions of the Walnut floodplain and yet, he built his

house on the first prominent rise above the floodplain. This fact supports the conclusion that knowledge of the local environment was passed along to later settlers so that even when bottom land was available, settlements were placed in the uplands.

Architecture

The barn was in continuous use by the Kobels until they moved off the land. As was apparently typical of barns in the lake area during the 19th Century, it was built with a limestone foundation and a wooden superstructure. It had interior dimensions of 36 ft. 1 in. east to west and 32 ft. 4 in. north to south. The foundation was uncoursed single wall construction using various sized cut limestone blocks 2 feet wide. Both faced and dressed stones were used to build the foundation. Although fire crazing has damaged many of the blocks beyond recognition, it is obvious from the remainder that no one style of dressing was used. There is some patterning possibly present in that the stones framing the doors and windows were dressed with a series of fairly uniform chisel marks, producing an almost checkerboard effect.

The barn was oriented with the main ground entrance to the south. A 4 foot wide door was placed in the southeast and southwest corners, and a double door in the middle of the south wall. Two constricted windows were in the east and west walls. Approximately the first four feet of the north wall are below surface when viewed from the exterior. For this reason the barn is termed a bank barn. A pile of earth covered limestone provided a ramp to the hay loft entrance in the north wall. It is unknown at this time, but the limestone in the ramp may have been the "spalls" (large pieces of debris resulting from quarrying, facing, and cutting blocks) and left over blocks from the construction of the foundation.

The exact source of the stone used in constructing the foundation is unknown. There are no visible outcroppings of limestone in the immediate area. The analysis of the limestone (Appendix 10.B) indicates that it is of local origin. A comparison between the limestone in the foundation and a sample from a quarry within a mile of the site is inconclusive.

Pine boards had been used to build the upper story and were also used as a flooring on the ground level. In addition, the ground floor had been stanchioned for the milking of cows. A cedar shingle roof topped off the structure.

On the exterior of the east wall are the remains of a lean-to shed that had been added on to the barn. The shed was a wooden structure with a corrugated tin roof. This addition had been used primarily as a machine shop and workshop according to informants.

Local oral history placed great importance on this structure. At the time of its construction this barn was apparently considered an outstanding achievement. Several different informants stated that the structure had been built at great expense, $800 being the most commonly cited figure.

It is highly unlikely that this figure is accurate when it is considered that in the early 1870's in Butler County stonemasons earned $2.00 to $2.50 per day; carpenters, $1.75 to $2.50 per day (State Board of Agriculture 1875:213); and the cost of pine was $25 to $70 per thousand board feet (State Board of Agriculture 1875). It cannot be refuted, however, that the Kobel barn was well built and an excellent example of its type. The esteem with which this structure was held by the local community is reflected by the fact that prior to its destruction by vandals in 1976, it had been selected for removal to the historic park being planned by the Butler County Historical Society (Madge Jones, personal communication).

Excavations

Test excavations at the Kobel site were initiated with two 1 by 2 m. pits. The first 1 by 2 m. unit, constituting Test Pits 1 and 2, was placed in the southeast corner of the barn so that it crossed the doorway. It was felt that these pits would produce a high number of artifacts because of the tendency for debris to accumulate around doorways. The second 1 by 2 m. unit, Test Pits 3 and 4, was placed along the center north-south axis of the barn, 1 m. south of the north wall. These pits were so placed because that area would have been central to the dairying activities carried on in the barn, as well as being directly beneath the main entrance to the hay loft. Thus, it was anticipated that artifacts associated with dairying and some of the material which collected around the loft entrance would be recovered (Fig. 10.34).

The barn had been built by cutting into the south face of a hill. Once the initial grass cover and ash deposit had been removed, the excavators were digging through the reddish brown silt typical of the lake area.

The first level of the excavations was the ash level. This deposit was the result of the wooden floor and superstructure burning. It varied from 5 cm. to 10 cm. in thickness. Immediately below this was the reddish-brown silt. The inference from this finding is that once the embankment had been cut the wooden floor had been laid immediately so that there was no buildup on the silt.

Though the number of artifacts recovered from this site was high, approximately 95% came from the ash level. The artifacts that did come from the silt zone were always within the first few centimeters. It is probable that these artifacts were deposited during the construction process prior to the laying of the floor or else they were ground into the silt zone by pedestrian activity in the area subsequent to the barn's burning.

Feature 1 (Fig. 10.35), located in Test Pit 2, was the builder's trench associated with the eastern section of the south wall. This was the only builder's trench observed during the summer's excavations. There was no trench visible in the profile of Test Pit 1 which abutted the eastern wall.

The trench was visible as an irregular grayish-brown soil stain extending out 5 cm. to 14 cm. from the first row of dressed stone in the foundation.

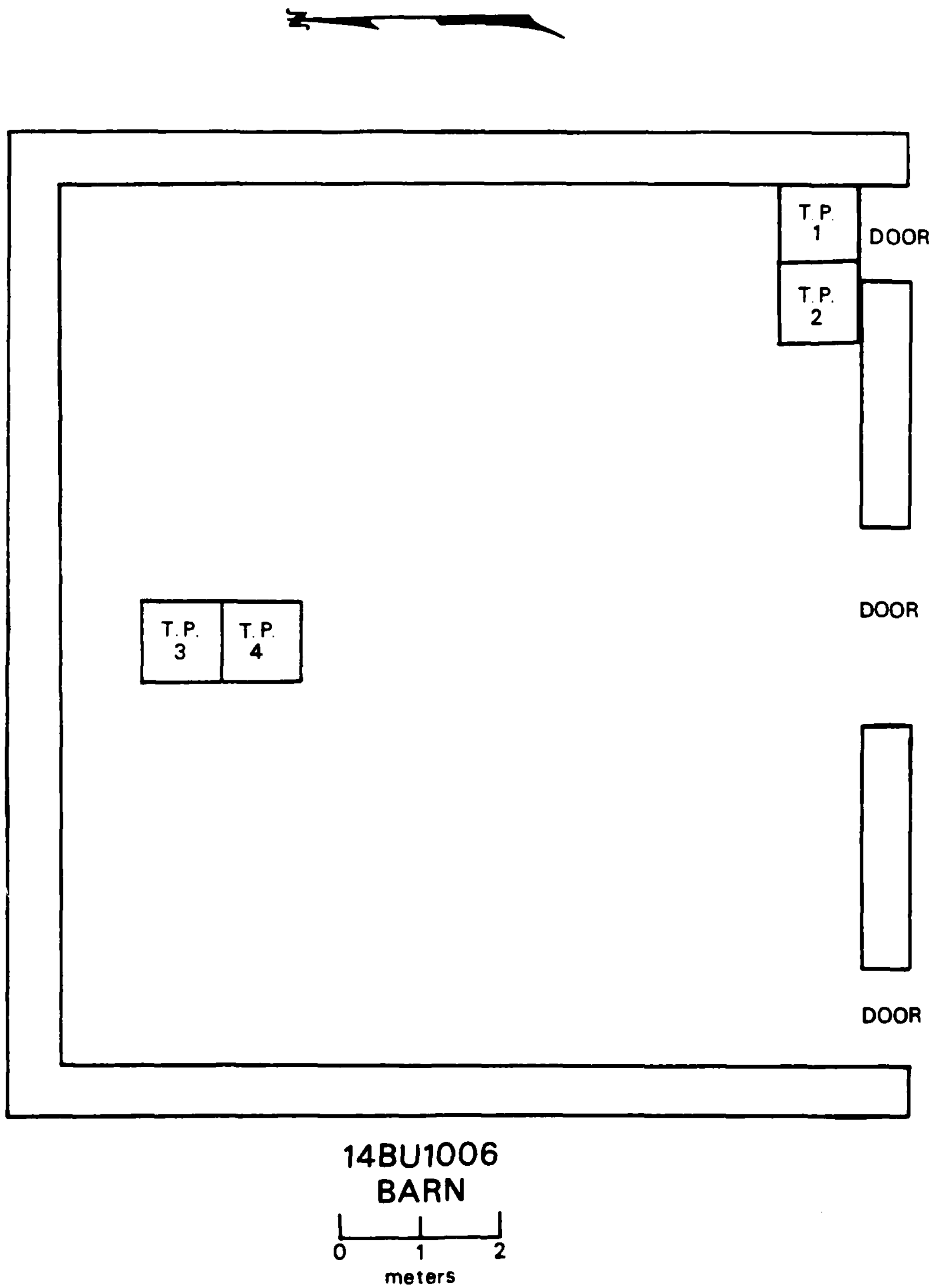

Figure 10.34. Kobel site, 14BU1006: plan of excavations.

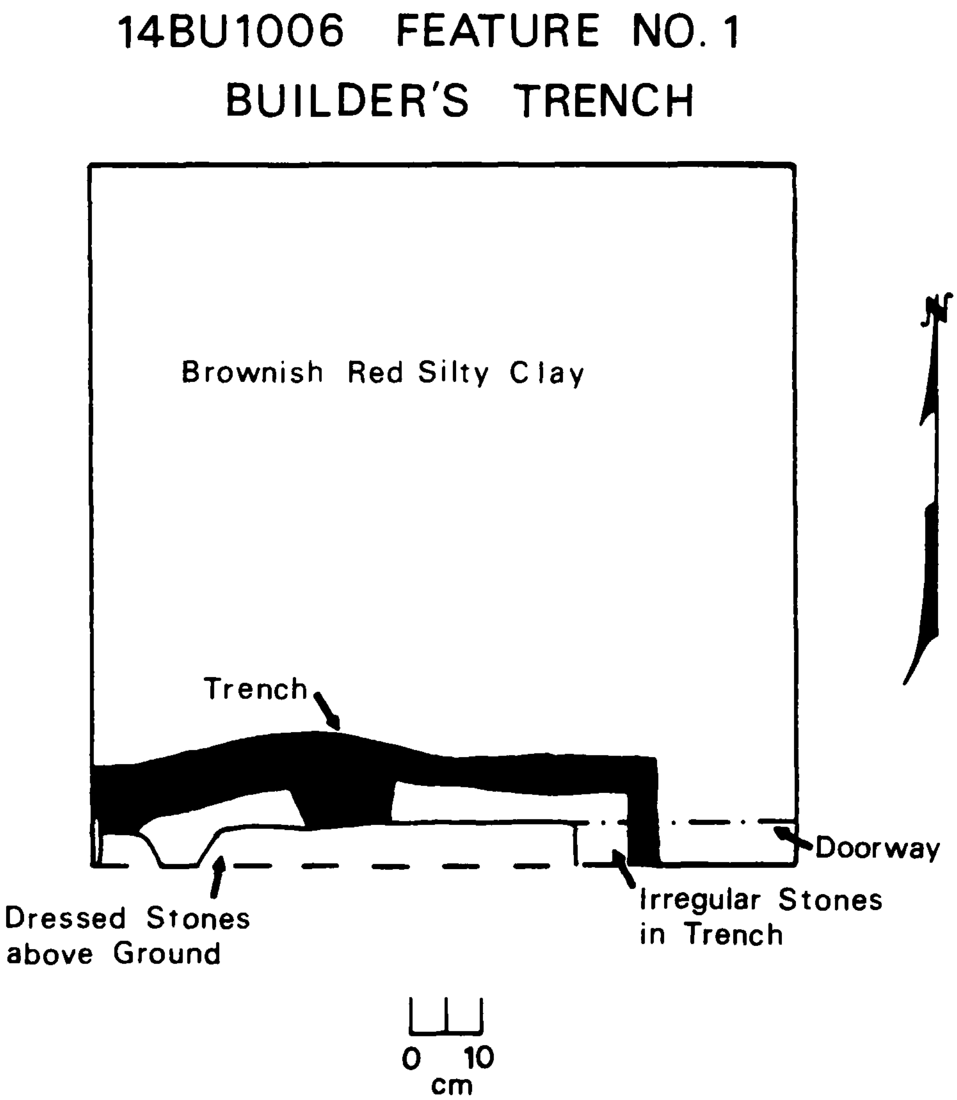

Figure 10.35. Kobel site, 14BU1006: plan of Feature 1, the builder's trench.

The loose soil that filled the trench had a high limestone dust and fragment content, indicating, from the fineness of the particle size, that much of the dressing had taken place after the stones had been positioned. Since the trench did not extend across the doorway it can be inferred that the foundation was laid out and trenches dug onlv where necessary. The depth of the trench averaged 33 cm. below the base of the first level of dressed stone. No artifacts were recovered from the trench. The lack of construction debris in the trench, with the exception of limestone fragments, indicates that the trench had been filled prior to the building of the

superstructure. All of the stones contained in the trench are irregular, showing only minimal shaping.

This builder's trench is probably typical of those dug at other sites in the lake area. The absence of visible stains at the other sites indicates that the trenches were not much wider than the stones they contained, as was the case here. Depending upon how the stones were placed in the trench, the stain may not be visible along the exterior side of the wall. The minimal shaping of stones below the surface is also a common trait for lake area sites. The fact that individual trenches were dug where foundation walls were erected rather than excavating a single, continuous trench is indicative of the parsimony of building activity displayed throughout the lake area.

Feature 2 (Fig. 10.36) is a grayish-brown stain that covers the northern half of Test Pit 3. The stain has a color and consistency similar to that of Feature 1. The limestone debris content is not as great in this feature as in the first. At this time the feature cannot be explained because an

Figure 10.36. Kobel site, 14BU1006: Feature 2.

emergency at 14BU1007 forced the curtailing of excavations at the Kobel site. Prior to backfilling these pits, a portion of the feature was removed revealing the brownish-red silt level sloping towards the north wall. The surface of the silt level was covered with a fine limestone powder and small fragments. On the basis of this evidence, it is suggested that Feature 2 represents a ditch/builder's trench with a sloping south wall. The large size of the trench, approximately 2.3 m. in width, would have facilitated laying the foundation stones against the bank of the north wall. The presence of the limestone debris on the surface of the silt level indicates that the trench was not filled in until the stones had been dressed.

It is recommended that the excavation of Feature 2 be completed. Based on the evidence at hand, it is predicted that the feature extends from the east to the west wall, averages 2.3 m. in width, and reaches its greatest depth directly before the bank on the north wall.

It was necessary to stop excavation at the Kobel site because it was discovered that a large portion of New Chelsea, 14BU1007, an early town site, was in the path of the railroad reroute that was under construction at the time. Since the railroad was already encroaching on New Chelsea and only a week was left in the field season, work was stopped at the Kobel site and all efforts concentrated on the endangered town site.

Future work in the lake area should include completing the testing of the Kobel site. This work should entail finishing the definition of Feature 2 (see above), testing outside the barn, and testing the site of the original log cabin.

Artifacts

The assemblage from 14BU1006 is unlike any other examined in this report. It is almost devoid of artifacts such as ceramics and bottle glass (cf. Tables 10.7 and 10.8). Over 95% of the assemblage is related to architecture or farming. Based on the analysis of this assemblage and those from other sites, it is possible that a quantified "pattern" (cf. South 1977) can be developed that will distinguish between habitational and barn sites strictly on the basis of material culture.

Surface Collection (n=60)

The Kobel site was overgrown making it impossible to surface collect thoroughly. All surface material was collected from the areas cleared for test pits. Fifty-eight of the specimens are nails. The other two specimens are a piece of charcoal and a metal hook such as those used on conveyer belts. Large items visible on the surface such as roller door assemblies, sheetmetal roofing, etc., were not collected. Table 10.7 contains a list of all surface material collected. Nails are discussed in Appendix 10.A.

Bottle Glass (n=4)

None are large enough to identify and there are no diagnostic specimens. The black glass is unusual. One of the black specimens has parallel ridges

Table 10. 7. Excavated artifacts, 14BU1006.

	T.P.1	T.P.2	T.P.3	T.P.4	TOTAL
BOTTLE GLASS					
Amber		1/100%			1
Black			2/100%		2
Clear				1/100%	1
FLAT GLASS					
Clear			17/74%	6/26%	23
STONEWARE					
Albany/Albany	1/33%			2/67%	3
WIRE	7/78%		2/22%		9
STAPLE			2/100%		2
MISC. METAL ARTIFACTS		1/25%	3/75%		4
MISC. METAL	1/7%	10/67%	3/20%	1/7%	15

on the exterior surface. The type of container or other object from which it comes cannot be identified.

Flat Glass (n=23)

Thicknesses: 1/10 inch (2 mm.); 1/16 inch (1.5mm.).

Only three specimens measure 1/16 inch. The 1/10 inch specimens are clear but have a green tint when viewed obliquely. All specimens are probably from window panes.

Ceramics (n=3)

All three are body sherds with an albany glaze on the interior and the exterior. The two sherds in Test Pit 4 are probably from the same crock. The piece in Test Pit 1 is from a smaller vessel.

Wire (n=9)

This site produced a remarkably small amount of wire. All of it is iron. Why so few pieces are present cannot be explained.

Table 10.8. Surface collection, 14BU1007.

TYPE	NUMBER OF SPECIMENS	TYPE	NUMBER OF SPECIMENS
BOTTLE GLASS		HORSESHOE	1
Amber	16		
Aqua	22	IRON SPIKE	1
Clear	17		
Cobalt Blue	1	BOLT	2
Manganese	8		
Milk	1	STOVE EYE	1
Olive Green	1		
		SHOTGUN SHELL	1
FLAT GLASS			
Clear	84	SQUARE CUT NAIL	1
WHITE PORCELAIN DOORKNOB	1	MISC. IRON	4
GLASS INSULATOR	1	COPPER	1
EARTHENWARE		ALUMINUM	1
Unglazed	1		
		BIFACE FRAGMENT	1
STONEWARE			
Albany/Albany	2	LIMESTONE	6
Albany/Unglazed	1		
Dark Red/Dark Red	1	COAL	9
Gray/Albany	4		
Light Brown/Albany	1	BRICK	6
Spatter/Albany	3		
Spatter/?	2	CEMENT	1
Blue Willow China	1		
		PLASTIC CAP	1
WHITE GLAZED CHINA	13		
		BLACK ELECTRICAL TAPE	1
WHITE GLAZED IRONSTONE	17		
		SHELL	7
WHITEWARE	1		

Nails (n=1379)

Nails constitute the single largest class of artifacts from this site. A total of 1376 were recovered from the surface or the ash fill; 3 were from levels below the ash. Of these, 1072 were wire nails, 296 were square cut nails, and 11 were too badly corroded to identify.

The preponderance of wire nails suggests a great deal of alteration

after 1890. Over a third of the wire nails were in the size range of shingling nails (4d) suggesting a new roof had been put on the barn. Half of the wire nails were varieties used in fencing, casing, and finishing. Many of these modern nails may have been stored in the barn and then deposited in the ash with the structural nails when the barn burned.

Part of the barn's fame in local history was that it had been constructed with wooden pegs. This may explain why few early nail types were recovered from this site.

A complete discussion of the nails from this site can be found in Appendix 10.A.

Staples (n=2)

Both are iron staples. There are two varieties: 1½ inch and 1¼ inch.

Miscellaneous Metal Artifacts (n=4)

Included in this category are a door or window latch with its "eye" screw; the copper end piece (shaft tip) of a wagon cross bar (Fig. 10.37b); a washer; and an unidentified iron object 7 3/4 inches by 1 inch, with a screw hole in either end and Z - 53 embossed on its rounded surface (possibly a felloe plate) (Fig. 10.37a).

Miscellaneous Metal (n=15)

Fourteen of these specimens are unidentifiable iron fragments. The remaining specimen is a copper fragment.

14BU1007 - The New Chelsea Site

The New Chelsea site is located approximately five miles northeast of present day El Dorado. The area is within the floodplain east of the Walnut River.

History

The history of New Chelsea has been reported at length in Chapter 9 of this report. Therefore, only the highlights will be repeated here.

This was the second of two frontier towns that bore the name Chelsea. A charter was granted to the town in 1870, but documentary evidence suggests that the town was in existence two years before that.

New Chelsea was created when residents of original Chelsea, 14BU1012, attempted to save their dying town. Original Chelsea suffered because it lacked major transportation connections. Thus, New Chelsea was established along the Old Emporia Trail, Butler County's first surveyed road and a major economic artery for the flow of goods. It was also believed that the new location would be more likely to obtain a railroad connection. The need for

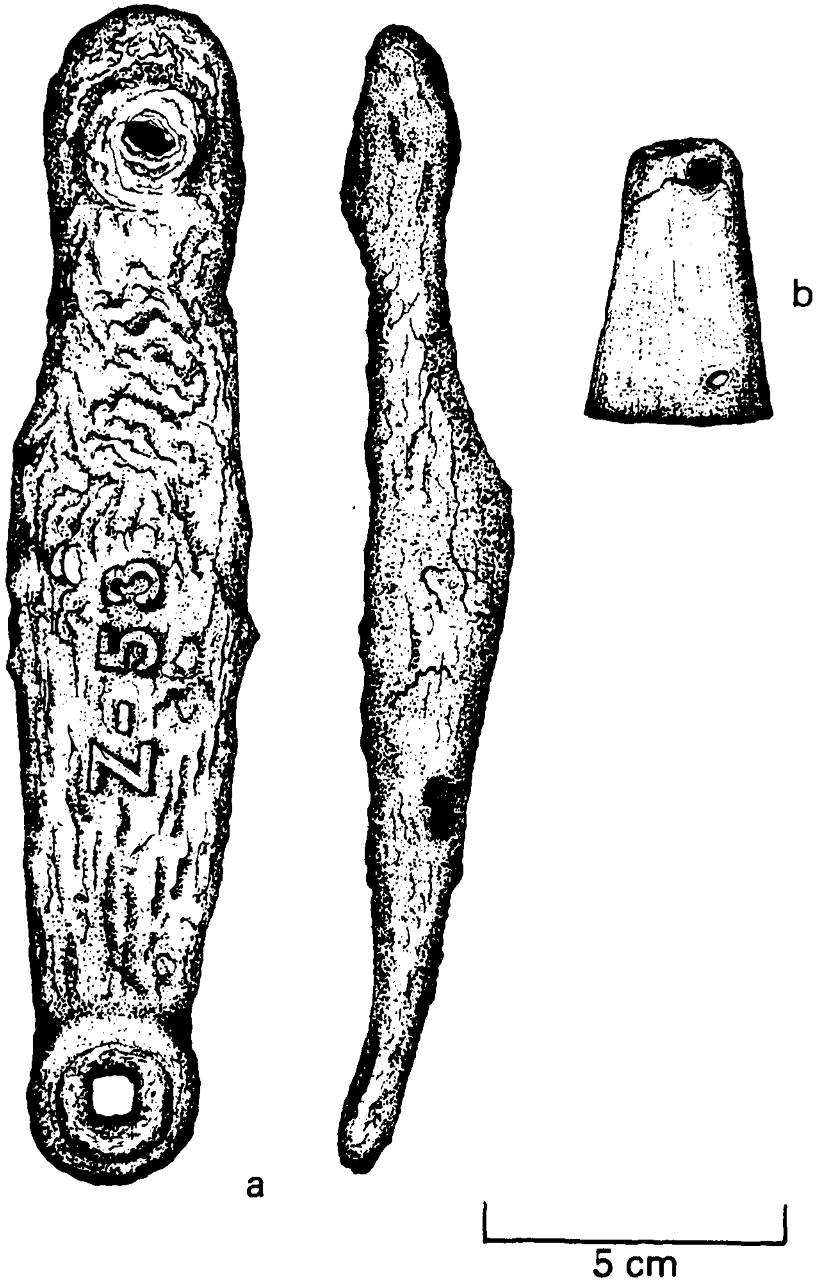

Figure 10.37. Kobel site, 14BU1006, artifacts: (a) unknown, possible felloe plate; (b) copper shaft tip.

transportation links was so great that it led the townspeople to a reversal of trends in settlement: at the time New Chelsea was created, settlers were moving from the lowlands to the highlands; but the residents of Chelsea moved their town from the uplands to the floodplain.

Although New Chelsea never held the position of county seat as original Chelsea had, the former was a more successful town than the latter. Population at New Chelsea at one time exceeded 200. Original Chelsea never had more than six buildings whereas New Chelsea, in addition to residences, had a hotel, drugstore, blacksmith shop, shoe shop, general store, and other enterprises.

The move for the Chelseaites promoted only short term gain for their town. When the all important railroad connection failed to materialize, the town began to decay. By the turn of the 20th Century, it no longer existed.

Since New Chelsea's demise, portions of the town site have been put under cultivation. Exactly how much of the town has been so affected is unknown because the exact geographical boundary of New Chelsea has yet to be determined. From the work performed during the summer of 1978, it can be stated with certainty that the railroad and a natural gas pipeline have destroyed portions of the town deposits. It was, in fact, an examination of the area disked by the railroad that led to a cessation of work at the Kobel site and the initiation of testing at New Chelsea. The disked area was later graded by the railroad construction company, totally destroying the shallow archaeological deposit.

Architecture

The remains of three buildings are present within proximity to New Chelsea: the Holderman house, H-78-8; Chelsea school, H-78-28; and Chelsea church, H-78-7. It is believed that the former two were within the town limits proper and the latter was on the northern outskirts.

The Holderman house was a two story, frame "I" house. There is a limestone foundation, probably representing the original structure. To this a concrete foundation was added to more than double the size of the dwelling. It is not known when the house was built, but informants report that it was the Chelsea post office and a general store in 1900. This house may have been one of the first New Chelsea dwellings. It definitely was the last.

Directly across from the Holderman house is the concrete slab foundation of a smaller building. Associated with it is a limestone and mortar root cellar. The cellar is probably older than the foundation - informants maintain that limestone and mortar were no longer used for root cellars by 1900, having been replaced by concrete. An examination of root cellars associated with post-1900 buildings revealed that all were made from concrete. The cellar was probably associated with an earlier 19th Century building.

Chelsea school was approximately 100 m. east of the Holderman house. It was a one-story frame school house with a gable roof and belfry, resting on a cut limestone foundation. The dimensions were 26 feet by 38 feet.

The school was built in 1869 by Bishop and Gordon, Chelsea residents. It served the Chelsea community as a school from 1869 until 1953 when it was sold to the Holderman family, who used it as a hog barn. The Butler County Historical Society was interested in saving the structure but was unable to come to terms with the owners. It was the owners who destroyed the school in 1976.

Chelsea's Methodist-Episcopal Church was built in 1902. Although it was not built until after the town was defunct, this church served the Chelsea community as a place of worship until 1963, when it was sold to the Holderman family who used it as a hay barn.

The structure was a simple 2½ story frame building with a steeple. Architecturally, the most significant aspect of the building was its interior which displayed several brilliant pieces of wood construction. The interior beauty of the structure led the Butler County Historical Society to attempt to salvage it. Again, the Society was unable to come to terms with the owners and so the church was demolished along with the school in 1976.

Excavations

The decision on where to place the test excavations was difficult. It was decided to test in the first undisturbed area south of the destruction caused by the railroad and pipeline. This was the area between the school and the concrete foundation. The decision to test here was further enhanced by information from two informants that a blacksmith shop had been due west of the school.

The tests were initiated with a trench 3 m. long and 1 m. wide, comprising Test Pits 1-3 (Fig. 10.38). Excavators encountered a layer of limestone cobbles, Feature 1, immediately below the surface (Fig. 10.39). This layer proved to be 10 cm. thick and contained historic artifacts. The limestone cobbles were smaller than those at the Lewellen site, averaging 2 cm. to 4 cm. in diameter. It was obvious from the density of the cobbles that this area had never been disturbed.

The cobbles were deposited in 1874 (Walnut Valley Times May 1, 1874). They were part of a "gravel walk" that extended the length of the lot on which the school stood.

Beneath the cobble layer was a dark, silty soil characteristic of much of the floodplain. This deposit was 20 cm. thick. The reddish-brown clay soil which was present at previous sites and always sterile, appeared at 32 cm. below the surface (Fig. 10.40). It was also sterile at this site.

Three more 1 by 1 m. test pits were opened at 2 m. intervals due north of the test trench (Fig. 10.41). The limestone cobble layer had been

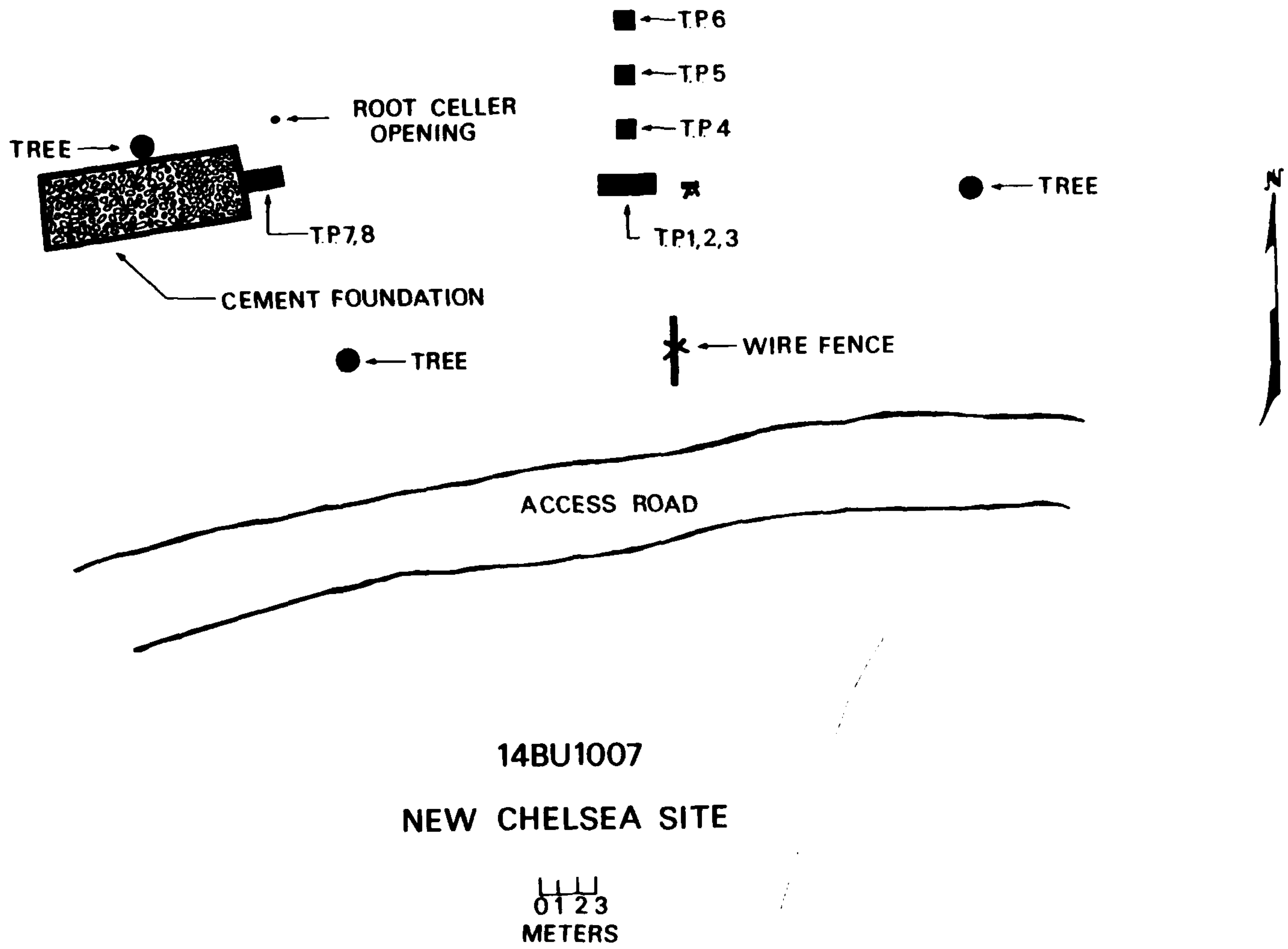

Figure 10.38. New Chelsea site, 14BU1007: plan of test excavations.

Figure 10.39. New Chelsea site, 14BU1007: Feature 1, the limestone cobble layer.

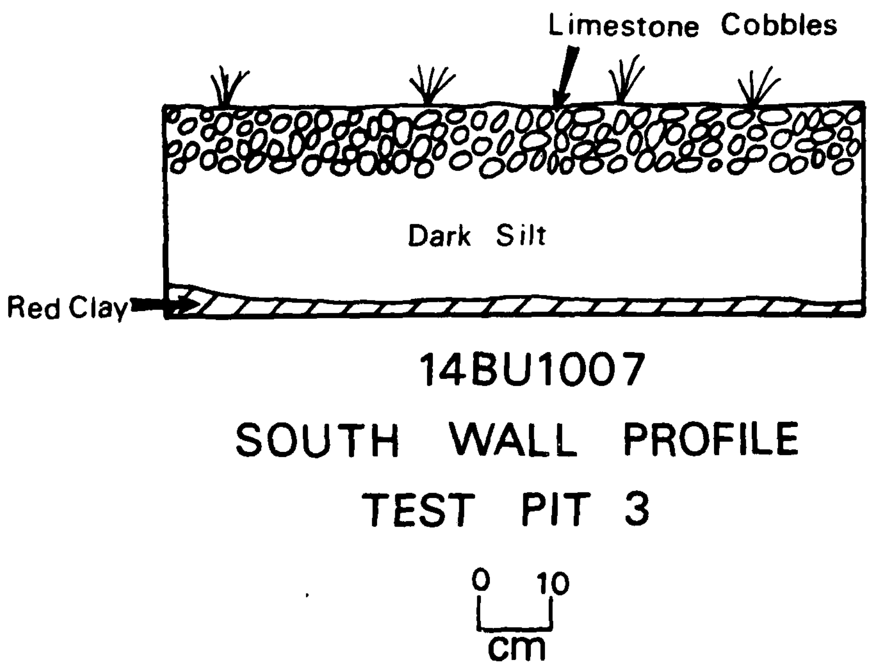

Figure 10.40. New Chelsea site, 14BU1007: profile of Test Pit 3.

Figure 10.41. New Chelsea site, 14BU1007: Test Pits 4, 5, and 6. Note the disturbed limestone cobbles in the profiles.

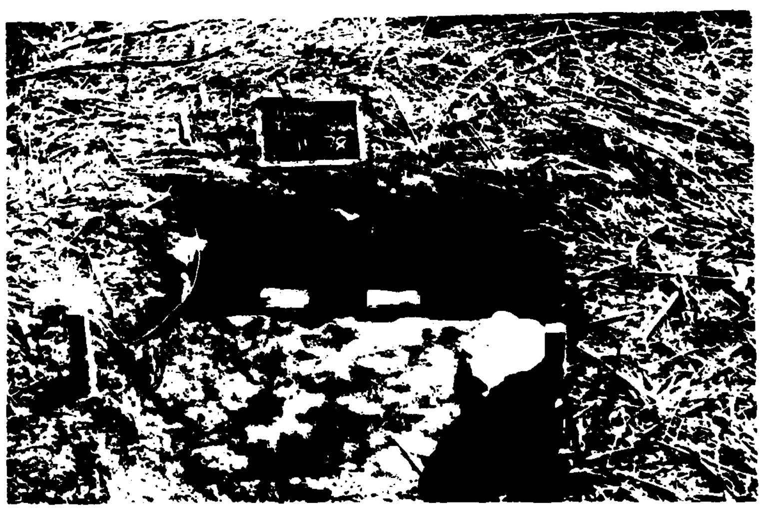

Figure 10.42. New Chelsea site, 14BU1007: Test Pit 7.

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disturbed in these pits. Rather than a compact zone, the cobbles were mixed with the underlying dark silt throughout the first 10 cm. The noticeably smaller amounts of limestone in Test Pits 5 and 6 suggests that the "gravel walk" did not extend out to those points.

Most of the artifacts recovered were of a household nature (ceramics, window glass, etc.). None of the material suggested the presence of a blacksmith shop. Therefore, it is suggested that this area was once the scene of a residence. It cannot be stated with certainty what kind of residence it was, but the presence of several large limestone blocks indicates a limestone foundation with a frame superstructure.

The quantity of material from beneath the cobble layer suggests the area had been in use for some time before the walk was deposited. Further, the artifacts mixed in with the cobbles suggest more than one deposition, a feature already noted at the Lewellen site. It is also suggested that the limestone and mortar root cellar west of the test area, near the concrete foundation, was associated with the hypothesized house. Future excavations in this area should clarify the relationships among the features.

On the final day of testing, two test pits, 7 and 8, were opened between the concrete slab foundation and the root cellar entrance. These units were not very productive. A zone of limestone cobbles was present (Fig. 10.42). Test Pit 8, which abutted the east end of the foundation, revealed that large pieces of limestone were present under the concrete. However, the limestone was not articulated; i.e., was not joined in any manner that would suggest a limestone foundation covered with concrete. The interpretation of this finding is that a bed of limestone, possibly from another structure, was deposited then a concrete slab foundation was poured on top of it. In this way the limestone serves as a frost barrier, protecting the foundation from cracking during freezing weather.

Artifacts

The assemblages from the New Chelsea site are the largest and most diverse of any site. Considering the number of different activities that are conducted in a town, it is not unexpected to recover such a range of material. Since a frontier town functions as the economic and social focus of an area, it should contain a material culture inventory similar to those of dependent sites. Virtually all of the major artifact types for the five other sites in this report are present in the New Chelsea site assemblages.

The excavated assemblage, although unusually high in numbers of certain artifact types, suggests the test area was a residence. Being situated between a school and store may be responsible for some of the unusually high totals of artifacts in the test area.

Surface Collection (n=237)

When it is considered that the surface collection was made over the entire site, while the excavated collection came from a small area, the two

are remarkably similar in composition. The primary differences are the paucity of metal artifacts and the presence of relatively recent pieces in the surface collection, as can be seen in Tables 10.8 and 10.9.

Although the surface collection is large only four pieces are chronologically diagnostic. All are bottle fragments. The four pieces are: 1) a fragment from a "Kelley's Old Cabin Bitters" bottle, patented in 1863 (Switzer 1974, Fig. 54) (Fig. 10.43e); 2) a ca. 1880-1900 olive green wine bottle fragment; 3) a ca. 1860-1880 aqua colored possible medicine bottle (Fig. 10.43d); and 4) a post-1905 beer bottle fragment (Fig. 10.43f). All bottle dates are based on seam height. A potentially chronologically significant artifact is an ironstone sherd with a portion of an unidentified maker's mark (Fig. 10.44f).

Three pieces of glass have portions of labels or manufacturer's marks that have not been identified. These are: 1) the base of a clear glass bottle high in manganese content with the mark: -TS- (Fig. 10.43b); 2) an amber colored bottle sherd embossed with -CS- / -L 10- (Fig. 10.43a); and 3) a probable 20th Century soda pop bottle showing a young boy and girl embracing on a bench with the following printed below: SQUEE- / reg. U.S. pa- / Min. Contents 10 F-.

The ceramic assemblage from the surface collection contains examples of types with relatively low frequencies of occurrence. Among these are specimens of splotched or spatterware (Fig. 10.44a), a white porcelain doorknob sherd (Fig. 10.44c), and white glazed stoneware with white on white embossed designs (Fig. 10.44e). There are more typical varieties of ceramics also present (Fig. 10.44d).

One of the few metal artifacts that was recovered from the surface is a fragment of a wood burning stove eye (Fig. 10.45c). The diameter of the eye is indeterminable.

Included in the surface collection is a small fragment of a biface made on a heat-treated Florence chert flake. This is the only Native American artifact recovered. It came from the area disked by the railroad rerouting crew. Further examination of this area may identify a prehistoric site.

Bottle Glass (n=152)

This is the second largest class of artifacts recovered. Most of the pieces are small. Only one fragment has lettering on it. This is an aqua colored fragment from a Mason's Perfect canning jar (Fig. 10.43c).

The extremely high totals of clear bottle glass from Test Pits 1 to 3 may be due to the store that was supposedly present near this area. It is doubtful that a residence would produce this many bottle fragments on its own. Also, there are many small pieces which may be distorting the figures. The actual number of bottles represented in the assemblage may be quite low.

Flat Glass (n=236)

Thicknesses: 1/8 inch, 1/10 inch, and 1/16 inch; 1/10 inch is most common.

Figure 10.43. New Chelsea site, 14BU1007, glass artifacts: (a-c) embosses bottle fragments; (d) possible medicine bottle, aqua colored ca. 1860-1880; (e) fragment of a "Kelley's Old Fashioned Bitters" bottle; (f) post-1905 amber beer or whiskey bottle neck.

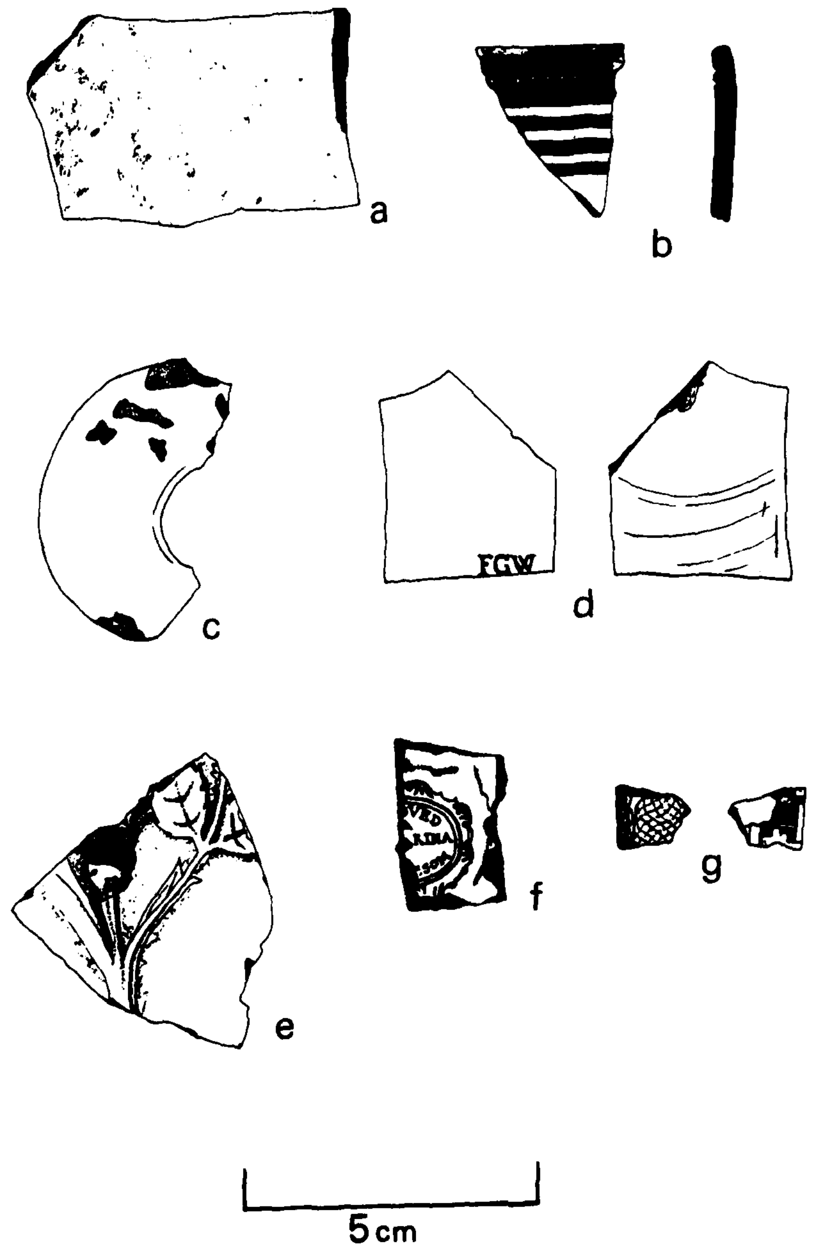

Figure 10.44. New Chelsea site, 14BU1007, ceramics: (a) splotched or spatterware; (b) custard cup fragment, banded ware; (c) white porcelain doorknob fragment; (d) stoneware; (e) white glazed, embossed stoneware; (f) ironstone with unidentified maker's mark; (g) blue transfer ware.

Table 10.9. Excavated Artifacts, 14BU1007.

TEST PIT	1	2	3	4	5	6	7	8	TOTAL
BOTTLE GLASS									
Amber		2/40%		1/20%	1/20%			1/20%	5
Aqua	3/19%	4/25%			2/12%	1/6%	1/6%	5/31%	16
Blue				1/100%					1
Clear	17/14%	35/28%	28/23%	9/7%	15/12%	4/3%	11/9%	5/4%	124
Green		1/100%							1
Milk	1/33%	1/33%			1/33%				3
Olive Green	1/50%		1/50%						2
FLAT GLASS									
Clear	25/11%	47/20%	92/39%	30/13%	24/10%	2/1%	10/4%	6/2%	236
GLASS JAR LID LINER		1/100%							1
WHITE GLAZED IRONSTONE		1/8%	5/42%		3/25%	1/8%		2/17%	12
WHITE GLAZED CHINA			1/50%				1/50%		2
BLUE TRANSFER WARE	1/100%								1
EARTHENWARE									
Albany/Albany	3/60%	2/40%							5
Albany/Unglazed							2/100%		2
STONEWARE									
Albany/Albany		1/20%		1/20%			1/20%	2/40%	5
Albany/Unglazed			1/100%						1

Table 10.9. *(Continued)*.

TEST PIT	1	2	3	4	5	6	7	8	TOTAL
STONEWARE (CONT.)									
Banded						1/100%			1
Bristol/Albany			3/75%				1/25%		4
Bristol/Bristol							1/50%	1/50%	2
Deep Red/Deep Red		1/100%							1
Red/?			1/100%						1
Yellow/Yellow			1/100%						1
Yellow/?		1/100%							1
Unglazed					1/100%				1
WIRE	2/10%	4/20%	1/5%		5/25%	2/10%	4/20%	2/10%	20
WAGON AND HARNESS PARTS			1/33%				1/33%	1/33%	3
CARTRIDGE CASES AND BALLS			1/25%	1/25%	2/50%				4
STAPLE				1/100%					1
STOVE PARTS					1/100%				1
MISC. METAL ARTIFACTS	3/23%	1/8%	1/8%	1/8%	1/8%		3/23%	3/23%	13
MISC. METAL	1/4%	1/4%	6/27%		2/9%	12/55%			22
MISC. NON-METAL ARTIFACTS		2/33%	2/33%		2/33%				6
UNWORKED STONE			1/50%	1/50%					2
TOOTH								1/100%	1

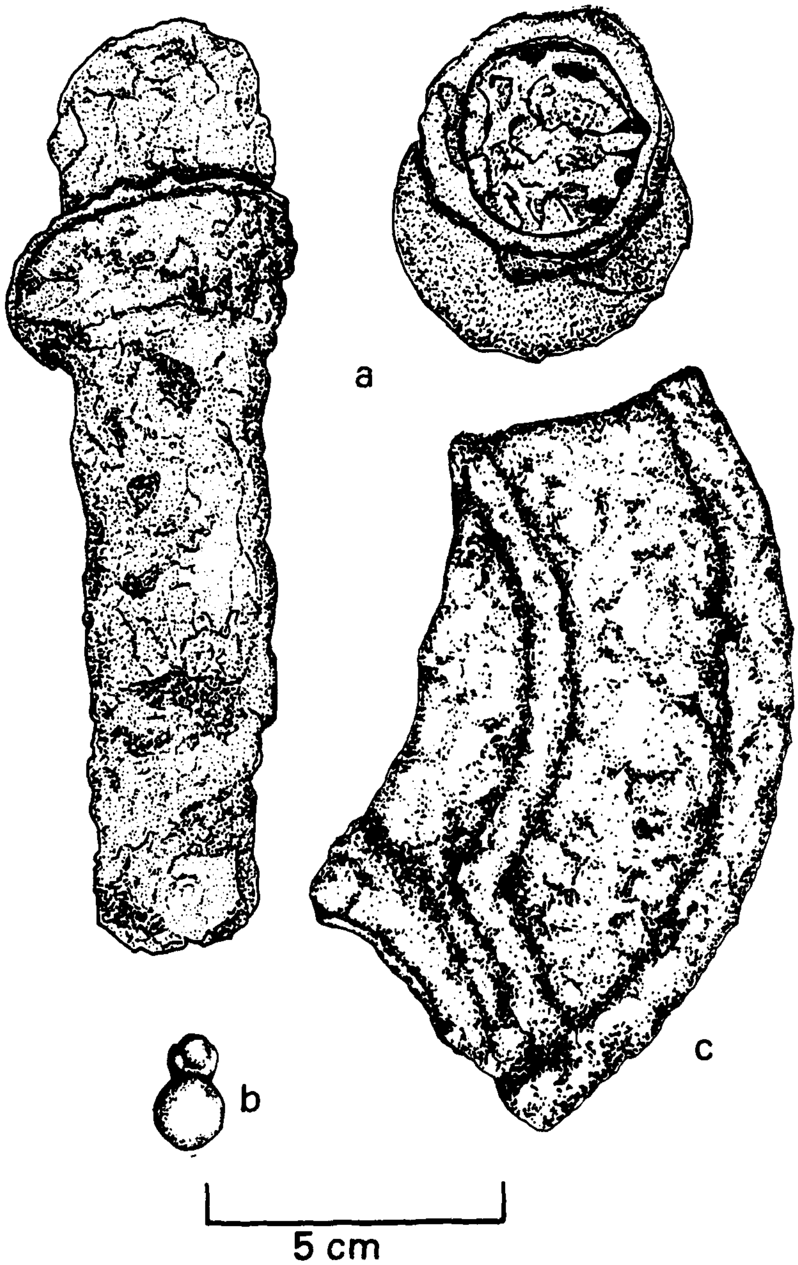

Figure 10.45. New Chelsea site, 14BU1007, metal artifacts: (a) wagon pole tip; (b) .45 - .46 calibre lead ball with sprue; (c) wood burning stove eye fragment.

Test Pits 1 to 3 have remarkably high totals. The large quantity of flat glass fragments indicate the presence of a structure. As was the case with the bottle glass, however, the fragments are very small and may be misleading in regard to the actual numbers of windows represented.

Porcelain Jar Lid Liner (n=1)

A fragment of one porcelain Ball jar lid liner was recovered from Test Pit 2.

Ceramics (n=40)

Crockery is well represented in this assemblage, but the sherds indicate smaller vessels than those recovered from the rural sites. This variation may be due to function: household versus dairy-related wares.

One particularly fine ceramic piece is a custard cup sherd from Test Pit 6 (Fig. 10.44b). This is an example of banded stoneware: yellow and blue bands are present on the exterior just below the rim. Between the bands and the lip, is a series of small bosses. The exterior is primarily a deep brown glaze; the interior is a white glaze.

An unglazed stoneware sherd from Test Pit 5 has a maker's mark (Fig. 10.44d). The mark is F.G.W. It has not been identified.

One very small sherd of blue transfer ware was recovered from Test Pit 1. The interior has a patchwork design, the exterior appears to be a city-scape (Fig. 10.43g).

Wire (n=20)

Twenty specimens of iron wire in various gauges were recovered. The small total for this class indicates that wire is primarily associated with rural sites.

Nails (n=155)

The 155 nails recovered from the test excavations at 14BU1007 represent one of the largest classes of artifacts in the assemblage. Eighty-five of the specimens are wire nails, 67 are square cut. Only 3 are unidentifiable.

The presence of wire nails below the gravel walk indicates such items were readily available in the early 1870's, but they comprise only 30% of the sample. In Test Pits 7 and 8, which are near an early 20th Century occupation site, wire nails comprise 77% of the sample. This reflects a shift in availability of different types of nails over an approximately 30 year period.

Consult Appendix 10.A for a further discussion of nails from the New Chelsea site.

Staples (n=1)

The single specimen is an iron 1½ inch staple.

Wagon and Harness Parts (n=3)

Included in this category is a 1 inch by 2 inch by ¼ inch iron bar with a hole in either end. One hole has a 2 inch carriage bolt in it. This piece is probably part of the tongue from a wagon.

A second wagon part is a pole tip (Fig. 10.45a). This is an iron tube 7 inch long, sealed on one end, with an orifice diameter of 1½ inches on the other. There is a three-quarter guard near the top of the piece.

The third piece in this category is part of a saddle cinch.

Cartridges and Balls (n=4)

This was the only site from which gun related artifacts were recovered. Included in this category are four .22 calibre cartridge casings (two long and two short) and one .45 to .46 calibre lead ball for a muzzle loading gun. The ball was never fired. It still has the sprue from the bullet mold attached (Fig. 10.45b).

Stove Parts (n=1)

This one specimen is a fragment of an eye from a wood burning stove (Fig. 10.45c). The diameter of the eye is indeterminant, but it is smaller than the example in the surface collection.

Miscellaneous Metal Artifacts (n=13)

Included in this category are four bolts, one nut, three washers, a large broken door hinge (possibly from a barn or the root cellar door), a small lead buckle, a brass button, a bottle cap, and an iron band.

Miscellaneous Non-Metal (n=6)

This category is composed of five pieces of slate and one small piece of leather. The slate may be fragments of a slate board. Such an item would have been common around a school. The leather is too small to suggest a function.

Unworked Stone (n=1)

One heat-treated chert chip was recovered from Test Pit 3. The presence of this piece and the biface fragment from the surface collection indicate a prehistoric site may be in the vicinity of New Chelsea.

Tooth (n=1)

This is not a human tooth but the species has not yet been identified.

Summary and Conclusions

The data amassed through the test excavations in conjunction with the documentary record allows a reconstruction of the settlement and development of the lake area. The knowledge that was accumulated contributes to three broad but interrelated areas of research interest: settlment patterns, material culture changes, and economic networks.

Settlement Patterns

The primary zone of occupation for the first settlers in the lake area was the floodplain of the Walnut River and its tributaries. This ecotone provided the necessary raw materials for building and closely resembled the eastern woodlands from which the original settlers came. These first pioneers were primarily agriculturalists and selected for the rich bottom land. By placing their farmsteads in the bottoms, they were able to maintain dwellings close to their fields.

Beginning in the late 1860's and continuing through the 1870's, some of the floodplain's characteristics which had originally made it attractive, began to force the inhabitants to move to higher ground. Essentially, the causal agents of the move were periodic flooding from the Walnut River and its tributaries, which was responsible for the lushness of the area, and increased water run-off from the surrounding cultivated fields. The increased understanding of their environment was shared with later arrivals as evidenced by the fact that new settlements in the 1870's and later occur in the uplands even when bottom land was available for occupation.

A minor period of settlement relocation related to the first occurred during the 1880's. This was the time period when some of those inhabitants who had previously moved to higher ground were forced to move again because of similar problems. Generally, the ones who had to shift were those who had moved from the floodplain to the second bottoms - a local term that generally refers to the first observable terrace above the floodplain. Occupation of the second bottoms apparently lead to increased agricultural activity in that zone and run-off again became a problem. The inhabitants were forced to move into the uplands. By the close of the 1880's most of the lake area's occupation sites were in the uplands.

Material Culture Changes

The most striking example of material culture change was in the architecture of the area. Wooden dwellings were the norm in the settlers' home areas and they continued this tradition when they arrived in the Walnut Valley. During the initial settlement period in the lowlands, the settlers made use of the available raw materials and built log cabins. None of these buildings survive, but accounts indicate they were simple in design and construction.

Movement out of the bottoms occurred during the Expansion Period (Chapter 9). The architectural changes reflect the nature of those times - the frontier period was essentially over; the area was fairly densely populated; the struggle for survival had been won, this was a time of growth. Substantial permanent buildings were erected during this period. These were deemed "progressive farms", as opposed to the log cabin "pioneer farms", (Mooney 1916:688).

A dichotomy in the construction of the substantial dwellings of this period appears to exist between the longtime inhabitants and the new arrivals. Among the sites examined during the summer of 1978, notably 14BU1005 and 14BU1008, the evidence clearly suggests that those settlers who had been among the first to arrive in the area and had stayed, built large limestone houses to replace their log cabins. Settlers who arrived during the expansion period built substantial log or frame dwellings (note 14BU1002, 14BU1003, 14BU1006).

The difference in construction material may be a function of familiarity. Longtime residents were familiar with limestone and its uses. They probably had done some previous stone work, such as fences, foundations, etc. The new residents, however, were not coming from areas where limestone was common. Their houses seem to reflect a desire to continue using familiar materials. Additionally, at that time, it was possible to acquire the necessary supplies, such as saw mill produced lumber and paneling, to build substantial homes rather than the simple log cabins of the first settlers.

Another important consideration may have been cost. Those who built stone houses were established, successful men who could afford to pay a stonemason. They also had the knowledge and ability to do the stone work themselves. The new arrivals may not have been able to afford a stonemason. By building in wood, they could build a quality home and do the work themselves.

On the basis of contemporary newspaper accounts and the prominence of these buildings in local oral history, it can be concluded that limestone houses were considered high status items. However, stone house building was a short-lived phenomenom. No stone houses have been identified with a construction date later than the mid-1880's. Although the houses have retained their prominence in the area to the present, the actual building period only lasted an approximate 14 years, 1869-1883.

Following stone houses, two or more storied frame houses became the dominant style. A frame house with a four rooms over four rooms floor plan and a pyramid shaped roof was the most common. Known locally as a "four-sloper", this type of house was common all over rural America during the late 19th and early 20th Centuries.

As occupation in the uplands increased, there was a concurrent increase in stockraising. The appearance of livestock weighing scales, large animal barns and extensive fencing (stone and wire) correlates with the shift to the uplands.

Both the surface and excavated ceramic assemblages are high in the number of earthenware and stoneware crockery sherds. Although crockery was common on most 19th Century sites, especially along the frontier (cf. Price and Price 1978), the El Dorado Lake area sites are particularly rich. This high proportion of crockery sherds, most of which were from large containers, is related to the increase in stockraising. Part of the stockraising enterprise in Butler County was the production of dairy products, particularly cheese. Butler County was one of the leading cheese producers in Kansas (Chapter 9) in the 1870's. Large crocks, such as those represented by the sherds recovered, were used in cheese production. The quantity of cheese that was being produced explains the unusually high number of crockery sherds. In addition, the distribution of crockery indicates that cheese production was a fairly widespread occurrence.

If sites from the 1860's are tested, they will probably contain proportionately fewer pieces of crockery. There will also be fewer crockery sherds from sites that post-date the cessation of cheese production on a large scale. This latter stipulation has already been seen at 14BU1003.

Economic Networks

Reconstruction of historic economic networks using archaeological data requires a sample of artifacts that can be identified as to time and place of origin (Adams 1978). Very few artifacts from the sites have any marks or other clues that indicate content, place of origin, or manufacturer. Of the few that do have marks, less than half have been identified. The few that are identifiable, suggest a possible trade relationship between this area and the rest of the world.

No artifacts have been identified as local products or products of any firms in Kansas. The majority of the identifiable specimens originated in states on the second American frontier, primarily Indiana and Illinois. A few came from farther east, New York and New Jersey. The implication of this finding is that the settlers maintained strong economic ties with the area from which they came. The relationship may have been maintained by farmers who preferred a particular manufacturer's product and ordered it or it may have been maintained by merchants who continued to buy from the suppliers they had used before coming to Kansas.

In the future, when larger collections with more identifiable specimens are available, it will be possible to refine the picture of the trade networks. There were undoubtedly several economic relationships operating at different levels of complexity but these are masked because of the small sample size.

Conclusions

Reconstructing and understanding the lives of Butler County's first settlers is a complex task. The historic sites archaeology project has proven that it can be done. What was once just so many broken pieces of pottery, crumbling structures, abandoned sites, and trash heaps are now

yielding the historic truths they contain. Parts of Butler County's history, long since forgotten, are now being rediscovered. Historical fact is replacing historical folklore. Aspects of life in Butler County that were never recorded in the histories are being reconstructed through the use of historic sites archaeology.

This first phase of the historic sites project has retrieved a great deal of information. Most of what was learned has elucidated the material culture adaptations made by Butler County's pioneers to life on the Plains. Some light was shed on the social and economic systems that were operating. Future work will reveal more about the social and economic networks as well as provide additional data about the physical adaptations.

It is true that El Dorado Lake is adversely affecting an area important in Butler County's history. Some significant sites and structures have already been destroyed, others will be, and many important historic sites will be flooded when the dam is finished. Although an historic object or place may have an inherent importance as a physical entity, it is the knowledge that can be extracted from it that must take precedence. This project is working towards the preservation and expansion of knowledge about Butler County's history, in order to minimize the loss of the physical manifestations and remains of that history.

Mitigation Proposal

Three different approaches to mitigating the adverse impact of El Dorado Lake on the area's historic resources are presented below. These three proposals can be categorized as Salvage/Preservation, Salvage/Excavation, and Preservation/Recording. Because of the complex nature of the historic materials, each proposal is tailored to the specific needs of a particular type of historic resource. The mitigation proposal requires that each approach be implemented as specified in order to adequately protect the historic resources of the lake area. Table 10.10 contains the recommendations for each site.

The mitigation proposal that follows assumes that the historic resources that have been identified will not be further altered until the plan has been implemented. To this end, the Tulsa District Corps of Engineers office and the El Dorado Lake engineers office, were notified of sites and structures that are endangered by vandals. The Corps agreed to post these sites with signs warning potential vandals of the legal consequences of their actions.

Salvage/Preservation

It is recommended that the log cabin at 14BU1003; the stone house at 14BU1005; and the stone bridge, H-78-86, be moved from the lake area. All three qualify for inclusion in the National Register of Historic Places under criterion D. Therefore, the Corps of Engineers must assume responsibility for their preservation under the guidelines of Executive Order 11593.

Table 10.10 Recommendations for further work.

Site	Test	Excavate	Further Documentation	Salvage or Record	No Further Work
14BU1001					X
14BU1002					X
14BU1003				X	
14BU1004	X		X		
14BU1005		X		X	
14BU1006		X			
14BU1007		X			
14BU1008	X		X	X	
14BU1009	X		X		
14BU1012	X		X		
14BU1013	X		X		
14BU1014	X		X		
14BU1015	X		X		
14BU1016	X		X		
14BU1017	X		X		
H-78-2					X
H-78-5					X
H-78-6			X		
H-78-7	X		X		
H-78-8	X		X		
H-78-11	X		X		
H-78-12					X
H-78-13A			X		
H-78-15					X
H-78-19					X
H-78-20			X		
H-78-21			X		
H-78-22					X
H-78-26	X		X		
H-78-28	X		X		
H-78-30	X		X		
H-78-32					X
H-78-33					X

Table 10.10. (Continued)

Site	Test	Excavate	Further Documentation	Salvage or Record	No Further Work
H-78-39			X		
H-78-40					X
H-78-41			X		
H-78-42					X
H-78-43				X	
H-78-47					X
H-78-48					X
H-78-49				X	
H-78-50				X	
H-78-51					X
H-78-52					X
H-78-55					X
H-78-56					X
H-78-57					X
H-78-59					X
H-78-63					X
H-78-64					X
H-78-65	X		X		
H-78-66					X
H-78-67					X
H-78-68					X
H-78-69	X		X		
H-78-74					X
H-78-76					X
H-78-77					X
H-78-78					X
H-78-80			X		
H-78-81			X		
H-78-82					X
H-78-84					X
H-78-85					X
H-78-86				X	
H-78-87					X

The two houses have been deeded over to the Butler County Historical Society by their owners. The Society is trying to raise money to salvage the two buildings, as well as the bridge. Through cooperation with the Society, the Corps can fulfill its obligations and share the expense of salvaging the properties.

Since Executive Order 11593 specifically charges federal agencies with protecting non-federal properties adversely affected by their activities, the Corps must make sure that the above named properties are properly maintained after they have been moved from the endangered area (King and Lyneis 1978:875). It must be remembered that the significance of these properties, particularly the houses, is not in the architecture alone, but also in the relationships between the buildings and their environment and between the buildings and the historical development of the area. The significant historic property cannot be considered salvaged unless these relationships are maintained. This can be accomplished by relocating the properties to areas that would preserve their environmental and historic associations. Therefore, it is recommended that the Corps of Engineers encourage the Historical Society in its plans to build an historic park. It would be to the Corps' advantage to provide an historic museum specialist to oversee the development of the park and preservation of the structures. The museum specialist can also seek additional funding to help reduce the Corps' and the Society's financial burdens.

Salvage/Excavation

Based on the results of the test excavations, the following sites are recommended for large scale salvage excavations: 14BU1005, 14BU1006, 14BU1007. All qualify for inclusion in the National Register of Historic Places under criteria C and D (36 CFR 60.6): The Doc Lewellen site, 14BU1005, contains deposits related to the entire historic period in the lake area from initial settlement through the expansion period, and on to the present. The Kobel site, 14ᵀJ1006, provides an excellent example of the late settlement period in the lake area. The New Chelsea site, 14BU1007, contains deposits that are vital to understanding the economic and social relationships that existed among sites in the lake area and between the lake area and the rest of the world.

Table 10.10 contains the recommendations for sites that should be tested.

Preservation/Recording

The stone house at 14BU1008 is a remarkable architectural specimen. It qualifies for inclusion in the National Register of Historic Places under criterion D. The double wall construction of the house, which is part of its architectural significance, and the extensive remodeling of the interior, make the removal and reconstruction of this building economically prohibitive. It is recommended that architects be brought in to do measured drawings and extensively photograph the house for inclusion in the Historic American Buildings Survey.

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APPENDIX 10.A

An Analysis of the Nails Recovered from the El Dorado Lake Area

APPENDIX 10.A

AN ANALYSIS OF THE NAILS RECOVERED FROM THE EL DORADO LAKE AREA

Mary Wilk

"For want of a nail a shoe was lost; for want of a shoe a horse was lost; and for want of a horse a rider was lost."

Benjamin Franklin
Poor Richard's Almanac, 1758

Introduction

The presence of a nail is hardly noticed until it is gone, Benjamin Franklin's adage tells us. And how true his words are. Luckily, nails have existed in one form or another since before the time of Christ. Their quantity and quality remained heavily dependent on the craftsman until the 19th century when technological innovations enabled them to be mass produced. During the 1800's the different types of nails earlier made by hand were being produced by machines in the form of square cut and then wire nails. They were designed in various sizes, as their predecessors, for different uses. Since the manufacturing dates are available for nails, their presence or absence at an excavated historic site can be an important clue in dating the structure. Nails can also be used at times to distinguish the style and builder of the structure. For our purposes here, however, we are primarily concerned with the nail as a dating tool for establishing a date of origin, length of occupation and alterations and additions made to the structure.

This report covers five historic sites that were tested at the El Dorado Lake Area during the summer of 1978. The five sites are the Foster Ice House, 14BU1002; the Marshall Cabin, 14BU1003; the Lewellen Stone House, 14BU1005; the Kobel Barn, 14BU1006; and Chelsea Town, 14BU1007. From these sites a total of 1752 nails or pieces of nails were recovered and identified. Around 1500 of these nails were complete with heads. The nails have been mapped and charted according to their respective site, test pit, level, type, style, and pennyweight. These data will be used in conjunction with the printed documentation available to date the structures.

Nail Chronology

Before individual sites are examined, a brief synopsis of the history of nails must be included. B. L. Fontana, et al. (1962), in their classic work done on square cut nails in Johnny Ward's Ranch: A Study in Historical Archeology gives the following chronology:

Before Christ-A.D. 1800: Nails were handmade, wrought nails, universally characterized by uneven, rectangular shanks that taper on all four sides to a point. For certain purposes wrought nails continued in use until as late as 1850, and in isolated instances may have been made in the United States when square cut or write nails were not available.

1790-1810: This period is characterized by machine-cut nails, the nail plate being reversed under alternate blows of the cutter to give the following cross section: Machine cut square nails exhibit the following characteristics: they taper on two opposite sides; exhibit uniform thickness because they are cut from a plate of uniform thickness; and have striations from the smear of the cutting blade. A few stamp-headed nails occur at this time but most are headed by a single hand driven hammer blow.

1810-1825: Machines are invented to make cut nails that obviate the necessity of having to turn the nail plate. The result is this cross section in the shank: Until 1825 such nails continued largely to be headed simply by being struck with a hammer.

1825-1830: Cutting of nails continues as immediately above, but water-powered machines are developed that head them automatically. The heads, however, are rather thin and lopsided.

c. 1830-c. 1855: Wire nails are invented in France that are ground to a point and headed by hand. They are rare in the United States during this period.

1830-c. 1890: Cut nails are produced in machines that cut and head them uniformly. Heads are less thin, more uniform, comparatively square and extra heavy on large nails. Cross sections of shanks on virtually all nails have the same type of bevel on the same side: Cut nails in the United States during this period outnumber all other kinds with respect to both numbers and varieties.

c. 1855-present: Machines are invented in France to make complete wire nails automatically. These nails are usually manufactured from steel wire, which is held in gripper dies and headed (producing gripper marks on shanks) then the wire is advanced and sheared to length with cutter dies producing a four-faceted point. (Technical Leaflet No. 48) Wire nail machinery was not perfected in the United States until the 1860's and 70's and it was about 1890 before wire nails outnumbered cut nails.

1871-present: Cut nails are annealed to prevent their rupturing when clinched. Before this time, wrought iron nails were used instead of machine cut square nails when a clinched nail was needed because they would not rupture (i.e., used on door latches and battens, facings of window shutters, etc.).

c. 1890-present: Cut nails continue to be manufactured for special purposes, such as securing wood to cement, concrete or plaster. Until about 1950, when they were replaced by cement-coated nails for the purpose, cut nails were also commonly found in subflooring for hardwood floors.

As outlined there are three major types of nails: hand wrought (B.C.-1800), machine or square cut (1800-1890), and wire (1890-present). Each type had many styles for different uses. For example, the hand wrought nail had about 300 different styles with no fewer than ten sizes of each; this is a total of 3,000 different nails (Fontana 1962:55). Square cut and wire nails are even more numerous.

Nail Function

Each type of nail was invented for a specific use. Their intended use can be distinguished by their shank length and the shape of the shank and head (Fig. 10.A1). As explained in the chronology, hand wrought nail shanks taper on four sides and their heads are hand hammered. The most common "rose nail" has four hammer hits (if done by an expert); the head of the "clasp nail" has downward sides to cut into the surface; "plancher nails" have T-shaped heads to hold down flooring; the "scupper" nailed leather (as for bellows); and the "brad" was used on planks (Sloan 1964:92; see Table 10.A1).

Square cut nails were also hand headed between 1790 and 1825. Usually this was done by a single blow of the hammer although a few were stamped. Beginning around 1825 machines were used to head nails and after 1830 the system was perfected so the heads were more uniform, less thin, and comparatively square. Square cut nails, however, continued in the tradition of

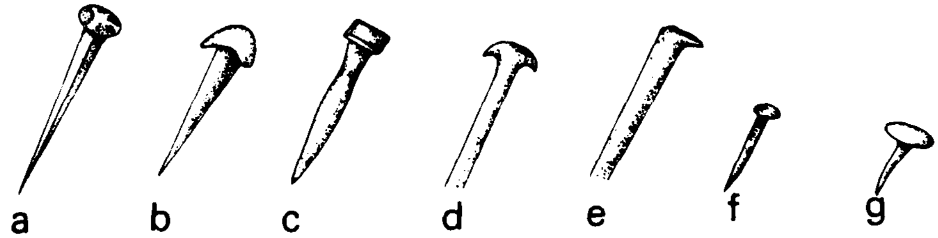

Figure 10.A1. Nail types: (a) rose sharp; (b) clasp; (c) horse; (d) plancher (flooring); (e) brad; (f) lath; (g) scupper.

Table 10.A1. Square cut nails.

PENNYWEIGHT*	NAME AND USE*
2-60d	Common square cut. Used for all purposes.
2-3d	Fine blued. Used almost extensively in wood lath work.
4d	Shingling and slating.
6-8-10d	Finishing. Used for finishing work inside buildings; small heads and square at point; countersunk in wood and hole concealed.
6-8-10d	Casing. Used on casings of doors and window frames, doorheads and flooring; taper in shank under head; square cross section at point.
6-16d	Fencing. Slightly raised or reinforced head.
6-16d	Shaped. A common cut nail bent consistently in a uniform manner.
6,7,8,10d	Brad. Used on moldings; extended taper in shank under head with rectangularly-shaped point.
6-10d	Clinch. More malleable nail used for making 3/4"-1 1/4" thick tongue-in-groove planks into batten doors and gates. Points beveled to help them bend back.
8-9d	Flooring.
9-10d	Boarding.
40-60d	Framing.

*See Table 10.A2 for pennyweight chart.
*See Figure 10.A2 for pictures of nails described.

having a different head or length of shank for the nail's specialized purpose. For a more extensive stylistic typology of square cut nails, see Table 10.A1 (Fontana 1962:57-60).

Wire nails continued in this tradition of different nail lengths dependent on specific use. The heads of wire nails, however, are always round. It is only the diameter and thickness of the round head that varies.

Table 10.A2. Nail sizes.

PENNYWEIGHT	LENGTH IN INCHES
2d	1
3d	1 1/8 (fine blued)
3d	1 1/4
4d	1 1/2
5d	1 3/4
6d	2
7d	2 1/4
8d	2 1/2
9d	2 3/4
10d	3
12d	3 1/4
16d	3 (casing)
16d	3 1/4 (all others)
20d	4
30d	4 1/2
40d	5
50d	5 1/2
60d	6

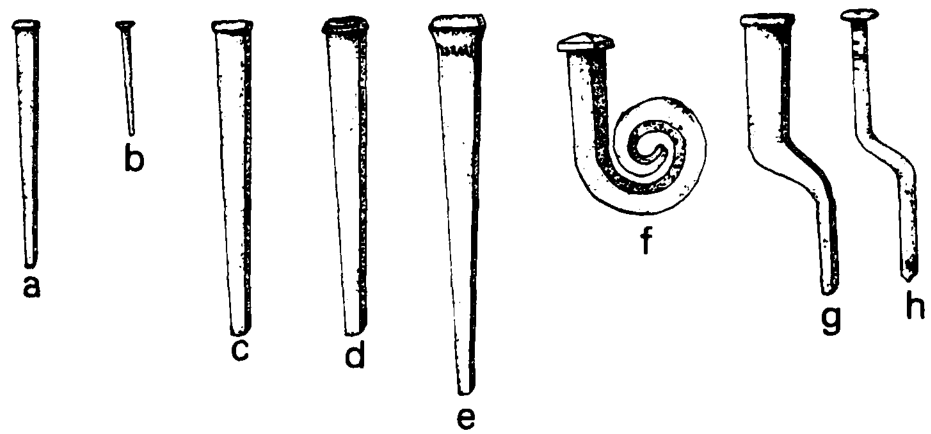

Figure 10.A2. Nail morphology: (a) common square cut nail; (b) fine blued nail (c) casing nail; (d) fencing nail; (e) brad; (f) clinched nail; (g,h) "shaped nail" (A variety sufficiently common in the lake area to warrant special notation).

El Dorado Lake Area

From printed documentation, it is known that the El Dorado Lake area was first inhabited by white settlers in the late 1850's; and that the earliest settlement was along the rivers (Mooney 1916:103). Butler County at this time was the western boundary for white settlement on the Plains. Documentation of the life styles of these settlers is sketchy for the period 1857-70. If we assume that Butler County was geographically isolated because of its western location then, theoretically, inaccessability to square cut nails should result in settlers making their own to meet their needs. The site where hand wrought nails are found should therefore be the earliest.

New Chelsea, 14BU1007, was the only pre-1870 site tested. No square cut nails were found at this site. This suggests that settlers at an early date were not making their own but purchasing them ready made.

Records show two trails, the Osage and Emporia Trails, went through this area. The settlers, therefore, may never have had the need to make their own but instead purchased or traded for them from merchants on the trail; or taken the trail themselves to a town where they could be bought. Records of purchase or exchange, however, have not yet been found.

After 1870 the need for each settler making his own was definitely gone, if there ever was one. Records show that a blacksmith shop had been established in Chelsea by John House by 1870 (Stratford 1934:110). It would be safe to assume that El Dorado, a town expanding comparable to Chelsea at this time, would also have had a blacksmith to produce cut nails.

Also, by 1870 the ties with surrounding towns were well established to supply the demand for nails. There was a daily stage coach run between Ft. Scott, Emporia, and Wichita by 1870 (Stratford and Klintworth 1977:39). The railroad had penetrated Kansas by this time and by 1877 a connection was made to El Dorado by the El Dorado and Walnut Valley Railroad, linking it to the rest of the country (Stratford 1932:141).

An advertisement in the first issue of the El Dorado newspaper, The Walnut Valley News, published on March 4, 1870, supports the fact that ready-made nails were available to the settlers: "E. R. Holderman & Bros., a local hardware merchant, has nails for sale." By this late date, any ready-made nails would be square cut nails. The following advertisement completely substantiates this claim; it appeared in the May 13, 1870, issue of the News: "Chicago House--Nails received this week, fifty kegs LaBelle (Wheeling, West Virginia) nails. This is the standard nail of America."

The wording of the nail advertisements, the lack of nail manufacturing done on any large scale in this immediate area, and the strong transportation connections seem to indicate that the majority of square cut nails used in this area were imported. From this we can hypothesize that when wire nails became available to the rest of the country, around 1880-90, they too were being imported into this area. The high percentage of wire nails found at lower levels of the five sites tested seems to support this fact. This hypothesis will be expanded on in the detailed report of each site.

Finally, there are two major problems that must be kept in mind when using nails as a dating tool. First, there is the broad date brackets for square cut and wire nails, respectively around 1800 to 1890 and 1890 to present. Secondly, use of a specialized nail depended on the knowledge of the builder and its availability. For example, the absence of fine-blued nails does not necessarily indicate the lack of lath work in a house; nor does the absence of brads indicate that a house was without moldings. The common square cut nail was manufactured in all sizes (2d-60d) and could have been used in place of specialty nails. It is the size of the nail, rather than the shape of its head (which in most cases are badly corroded), that is most useful in identifying the composition of the structure.

14BU1002 - Foster Site

Property records state that Charles and Lucy Foster, from New York, purchased this property on November 26, 1873. The site was continually occupied until 1974 when purchased by the Corps of Engineers.

Excavation of this site took place because of the discovery of a cut limestone foundation still remaining slightly above surface level. From the dimensions, 16' by 12', it was first assumed to be the foundation of a house. Further excavation and investigation into written and oral records suggests that this structure was built for weighing scales and later was used as an ice house. The nails found at this site support this theory:

1. A single hand wrought nail was found at this site close to the surface (0-5 cm.). Hand wrought nails continued to be made throughout the 19th century for special purposes. Weighing scales may have necessitated just such a nail.

2. All the nails had been disturbed within the walls of the foundation. They were found among the limestone spalls that were used to fill in the weighing scales. The presence and high total number of wire nails compared to square cut nails (35 to 9) at all levels indicates that the change in use took place post-1890 (Table 10.A3).

3. The variety in size of the nails suggests the presence of a superstructure. The common square cut and wire nails are those sizes used for: lath work, finishing, asing, flooring, boarding, and framing (Table 10.A4).

4. The higher percentage of wire nails over square cut nails implies that the structure that needed more nails was built after 1890. In this case it would have been the superstructure of the ice house.

5. Lastly, the fact that such a low total number of nails was found (72) indicates that the superstructure was moved (if we are correct in assuming that a superstructure was present).

Table 10.A3. 14BU1002 Foster site nail distribution.

		2	3	4	5	6	7
	0-5		1A,1B,3C	2D			
	5-10		1B,3C	1D	4C,8D	2D	
L	10-15		1B		1C	2C,3D	1C
E	15-20	1C				2B	
V	20-25		1C	4C			
E	25-30						1B,5C
L	30-35						
	35-40				1B,8C		
	40-45				1C,1D		
				limestone foundation: 2B,5C			

KEY	TOTALS
A-Hand wrought nail	1
B-Square cut nail	9
C-Wire nail	35
D-Unknown (too badly corroded)	17
	62

14BU1003 - Marshall Site

This cabin was built in the summer of 1874 by William J. Marshall four miles northeast of El Dorado, Kansas. The cabin was later owned by Thomas G. and John M. Pirtle in 1884 and Washington Teter in 1885 (Walnut Valley Times, March 26, 1906). Washington Teter moved the cabin 1/8 mile west because of water problems in the stone basement. At this time the stones from the basement were removed and the hole filled in. He lived in the cabin from 1885 until about 1900, selling the cabin at this time to James Westly Teter. James Teter owned the cabin until his death in 1929, leaving it to his daughter Ora who was married to Charles Robert Nuttle. The cabin belonged to the Nuttle family until its purchase by the U.S. Army Corps of Engineers in 1974.

Test pits 1-5 were placed at the supposed original location of the cabin, based on a high concentration of surface scatter and written documentation. In test pits 1-3, taken down to 30 cm., only square cut nails were found. The presence of square cut nails at all levels supports the idea that this was the original house site (Table 10.A5). In test pit 4, taken down to 40 cm., two wire nails were found at the 30-40 cm. level. We know from documentation that this area was disturbed (when the basement was removed) in 1885. The wire nails must have been present at this time either in use or in storage

Table 10.A4. Nail types by size.

		Wrought	Common-Square Cut	Common-Wire	Plancher-Square Cut	Finishing-Wire
	2d					1
	3d			1		
P	4d		1			
E	5d		1	4		
N	6d		1		1	
N	7d			2		
Y	8d	1		9		
W	9d		1	1		
E	10d		1			
I	12d					
G	16d			2		
H	20d			2		
T	30d			5		
	40d					
	50d					
	60d			2		
		1	5	28	1	1

Broken: 10
Badly corroded: 26

TOTAL: 72

in the basement. This indicates that wire nails may have been introduced earlier into this area than the previously assigned date of c. 1890.

Test pit 5 was probably outside the location of the cabin because there were no nails found.

Test pit 6 was placed in the sloping bank of the river nearby where refuse was supposedly thrown. A total of one square cut nail and eleven wire nails were found between the 40-70 cm. level. This would imply that refuse continued to be dumped here after the house had been relocated.

If our knowledge of this site had been limited to only the extracted artifacts, the wide variety of nails found would have determined this as a house site (Table 10.A6). There was a wide range in size of common square cut nails, as well as a wire brad and a finishing wire nail. These are all types used in house construction.

Table 10.A5. 14BU1003, Marshall site nail distribution.

		1	2	3	4	6
	0-10		7B		3B,1C	
L	10-20	10B	12B	3B	1B	
E	20-30		2B	4B	4B	
V	30-40				1C	
E	40-50					4C
L	50-60					1B,5C
	60-70					2C

KEY	TOTALS
A-Hand wrought nails	1
B-Square cut nail	48
C-Wire nail	13
D-Unknown (too badly corroded)	0
	62

14BU1005 - Doc Lewellen Site

The Lewellens were a prominent family in this area and in Wichita. Doc Lewellen first acquired this land from the United States government between 1868-70. Written documentation states that he first built a log cabin along the banks of the Walnut River (Mooney 1916:104); then he built the stone house in 1874 and lastly built a clapboard house in the 1880's because the stone house was taking in water--he again built too close to the Walnut River. The stone house was later used to stable horses, and a lean-to was added to the South side (this has since been removed). It is presently used for hay storage.

The distribution of nail types at this site was what could be expected from the knowledge we already had about it from written records (Tables 10.A7 and 10.A8). Due to its early construction date and its continued use into the 20th century both square cut and wire nails were present. The concentration of these nails appears to be heavier on the north, or left side, of the front door than on the south (test pits 6,7,18,24). This could be an indication of people throwing their refuse to the left from the doorway. Also, the path leading to the barn from the house was to the right, or south, of the door--nails would not have consciously been thrown there for obvious reasons.

There is a possibility that a porch was present at one time along the front, east side, of the house. Twenty-nine common square cut and wire nails of the size used for flooring (8d) were found. This was also the highest total number of one size of nail found at this site. The fact that 14 of

Table 10.A6. 14BU1003, Marshall site nail sizes by type.

		Common-Square Cut	Common-Wire	Wire Brad	Finishing-Square Cut	Shingling-Square Cut	Framing-Square Cut	Casing-Square Cut	Brad-Square Cut	Finishing-Wire
	2d	1								
	3d	2								
P	4d	5	1			1				
E	5d	3								
N	6d									
N	7d		2							
Y	8d	7	6		2			5	1	1
W	9d									
E	10d	2								
I	12d									
G	16d						2			
H	20d		1							
T	30d									
	40d	1	1							
	50d									
	60d									
Broken:		16		1						
		37	11	1	2	1	2	5	1	1

Badly corroded: 1

TOTAL: 62

Table 10.A7. 14BU1005, Doc Lewellen site, nail distribution.

TEST AREA I (House)

LEVEL	1	2	3	4	5	6
0-10	5B,1C	5B,1C		1B,2C	2B,3C	14B,3C,1D
10-20						1B,1C
20-30						

LEVEL	7	8	9	16	17	18
0-10	7B,2C	1C	1B	2C	1B,2C	4B,2C
10-20						
20-30						

LEVEL	19	20	21	22	23	24
0-10	2C	3B	1B	2B,3C	4B,1C	8B,3C
10-20						
20-30						

TEST AREA II (Barn)

LEVEL	10	11	12	13
0-10	1C	2C		
10-20				2C
20-30			2B	2B

KEY	TOTALS
A-Hand wrought nail	0
B-Square cut nail	63
C-Wire nail	34
D-Unknown (too badly corroded)	1
	98

Table 10.A8. 14BU1005 Lewellen site nail types by size.

TEST AREA I (House)

		Common-Square Cut	Common-Wire	Casing-Square Cut	Finishing-Wire	Brad-Square Cut	Plancher-Square Cut
	2d	1					
	3d	3					
P	4d	13					
E	5d	2				1	
N	6d	4	3			1	
N	7d	1	1				
Y	8d	15	14	1	1		1
W	9d						
E	10d						
I	12d						
G	16d	9	3				
H	20d	1	4				
T	30d						
	40d						
	50d						
	60d		1				
Broken:		1	2				
		50	28	1	1	2	1

TEST AREA II (Barn)

		Common-Square Cut	Common-Wire
	2d		
	3d		
P	4d		
E	5d		
N	6d	2	1
N	7d		
Y	8d	1	1
W	9d		
E	10d		1
I	12d		
G	16d		1
H	20d		1
T	30d		
	40d		
	50d		
	60d		
Broken:		1	
		4	5

Badly corroded: 1

TOTAL: 93

29 nails were wire would indicate that the porch was probably added in the late 1880's - or right before the move was made to the frame house. The porch was removed at some later date - probably before it was used to stable horses.

Thirteen common square cut nails of the size used for shingling (4d) were found. No wire nails of this size were present. This would imply that a cedar shingle roof, the most common in the 19th century, was present before the sheet metal roof that now covers the structure.

There is one type of nail missing from this site that would have given credence to the statement made by an informant (Joe Lewellen, present owner and grandson of Doc Lewellen) that the house was used to stable horses. There were no "horse" nails, those used in shoeing horses, found. There may be some present inside the structure but we were unable to test inside because it was still being used for hay storage by its present owner.

14BU1006 - Kobel Site

The Kobel Barn is one of the oldest standing structures on Corps property - it was built in 1871. This barn faced south and had a ramp on the north side, a dirt grade with limestone blocks on each side for support, that led to the hayloft. There was a door on the west gable end of the barn where the loose hay was pitched in. The bottom floor of the barn was stanchioned for milking cows. The floor of the barn was made of pine, as were the walls, above the bottom floor walls of cut limestone. According to an informant (Craig Kobel, last owner) the barn had never been altered except for the replacement of the roof that was blown off before 1950. This barn was in use until the fall of 1976 when fire destroyed it.

For this site, a total of 1379 nails were recovered, 1072 wire nails, 296 square cut nails and 11 nails corroded beyond identification (Table 10.A9). Because the barn was burned down, all of these nails are disturbed. A total of 1806 were recovered from the ash layer alone.

The presence of square cut nails supports a pre-1890 date of origin. The large number of wire nails would indicate that some type of alteration was made to the barn after 1890, contrary to our informant's belief. A large portion of these wire nails, 364 to be exact, are of the size used for shingling (Table 10.A9). This is the result of the roof being replaced sometime in the 20th century. But 529 of these nails are roughly the sizes used for finishing work, casing of doors and windows and fencing. There were 64 nails recovered that indicate heavier structural work like boarding and framing - but these could have been replacement nails. The type of specific alterations may not be decided from the presence of these nails alone, but it can be assumed that extensive internal alterations <u>were</u> made some time after c. 1890.

A category of nail has been included here that was found only at the Kobel barn site and the Chelsea town site. This is the "shaped" nail. This is a common nail, both square cut and wire, that was bent consistently in

Table 10.A9. 14BU1006, Kobel site nail distribution.

		Test Pits			
		1	2	3	4
	Surface	10B,20C	2B,24C		
L	0- 5			116B,248C	28B,89C
E	5-10	72B,367C	47B,287C		
V	10-15			7B,9C,11D	8B,14C
E	15-20	3B,12C	2B,1C		
L	20-30			1B,1C	
	30-40	1C			

KEY	TOTALS
A-Hand wrought nail	0
B-Square cut nail	296
C-Wire nail	1072
D-Unknown (too badly corroded)	11
	1379

a uniform fashion. Forty-one were found at this site. The specific use has yet to be determined.

14BU1007 - New Chelsea Site

The town of Chelsea (14BU1012) was established in August, 1857 by a small band of 24 settlers. It became the first county seat of Butler County in 1859 and remained so until 1867, losing this privilege to El Dorado at that time (Mooney 1916:54). In an attempt to save their town, Chelseaites moved Chelsea to a location along the Emporia trail. On October 12, 1870 they filed for a new town charter. At this time New Chelsea (a name used in this project to distinguish 14BU1007 from original Chelsea) was a settlement of from 12-15 buildings which included a blacksmith shop, dry goods and clothing store, shoe shop, school, hotel, drug store, and saloon (Mooney 1916:566). In 1874, it was the fifth largest town in Butler County with a population of 150 (Kansas State Board of Agriculture 1874:37). By 1884, however, New Chelsea was not even mentioned in the list of towns in Butler County (Augusta Electric Light, August 6, 1885). There are numerous reasons why the town of Chelsea failed - the major reason being that it was not linked to a railroad and El Dorado, just ten miles away, was by 1877.

Excavation of this site was begun with eight test pits placed west of the old Chelsea school house (one of two standing structures left) and approximately five meters north of the present access road. Because of the highly contradictory information acquired from local informants and the lack of

Table 10.A10. 14BU1006, Kobel site, nail types by size.

		Common-Square Cut	Common-Wire	Horse-Square Cut	Shaped-Wire	Roofing-Wire	Brad-Square Cut	Casing-Square Cut	Shaped-Square Cut
	2d	4	2			1			
	3d	75	362	1					
P	4d	2	4						
E	5d	2	352			1			
N	6d	2	37		39				
N	7d	2	2						
Y	8d	63	177				6	3	1
W	9d	1							
E	10d	12	7					1	
I	12d								
G	16d	6	9		1				
H	20d		47					1	
T	30d	4	8						
	40d								
	50d								
	60d		1						
Broken:		108	22	1			1		
		281	1030	2	40	2	7	5	1

Badly corroded: 11

TOTAL: 1379

written documentation specifying the location of the town's buildings, a location relatively close to a standing structure was chosen.

Excavation of this site revealed building activity had taken place. Both square cut and wire nails (found in almost equal number) were recovered down to 30 cm. indicating a date of occupation around the transition period from using square cut to wire nails (Table 10.A11). The wide variety of nail sizes and types indicates diversified building taking place (Table 10.A12). Shaped nails, previously found only at the Kobel barn site, were also present - their purpose still a mystery.

Further excavation and investigation of this site is necessary before any more conclusive statements than these can be made.

Conclusions

In conclusion, I would like to reiterate two problems in the use of nails for dating in the El Dorado Lake area. First, there is no way to trace the origin of a square cut nail back to its maker for a more specific date. Once produced, the 1860 square cut nail is identical with the 1890 cut nail,

Table 10.A11. 14BU1007, New Chelsea site, nail distribution.

		TEST PITS				
		1	2	3	4	5
L	Surface	1B				
E	0-10		2C	1B,1C	1B	5B,2C
V	10-20	4B,4C	2B	6B,2C	3B,1C	2B,2C,1D
E	20-30		3B,1C	6B,1C,1D	4B	1B,4C
L						
L		6	7	8		
E						
V	0-10		5B,13C,1D	7B,21C		
E	10-20	1C	1B,4C	4B,17C		
L	20-30	1B,1C	1C	2C		

KEY	TOTALS
A-Hand wrought nails	0
B-Square cut nail	67
C-Wire nail	85
D-Unknown (too badly corroded)	3
	155

Table 10.A12. 14BU1007 New Chelsea site, nail types by size.

		Common-Square Cut	Common-Wire	Shaped-Wire	Brad-Square Cut	Roofing-Wire	Fencing-Square Cut	Roofing-Square Cut	Finish-Wire	Shaped-Square Cut	Casing-Square Cut
	2d	4	2			1					
	3d	11	6			1					
P	4d	2	5								
E	5d	1	4								
N	6d	2	10		2			1		1	
N	7d						1				
Y	8d	12	14	9	1						1
W	9d		1	12					1		
E	10d	5	6								
I	12d										
G	16d	1	5		1						
H	20d		6								
T	30d										
	40d	1									
	50d										
	60d										
Broken:		21	3								
		60	62	21	4	2	1	1	1	1	1

Badly corroded: 3

TOTAL: 157

especially after it has been in the ground for a number of years and corroded. This is also true for wire nails and probably more so since they were always produced by the machine-factory method.

Secondly, the absence or presence of a specialty nail, such as a brad, finishing nail, shingling nail, etc., does not necessarily reflect that type of building activity. The choice of nail used was ultimately left up to the builder. Lack of knowledge about the use of specific types of nails or the unavailability of a nail type at the time of construction would result in the improvisation of another type or size of nail. Therefore, nails should not be the only artifact used to identify a building but should be used in conjunction with other archeological evidence and documentation.

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APPENDIX 10.B

Results of Limestone Analysis

APPENDIX 10.B

RESULTS OF LIMESTONE ANALYSIS

El Dorado Quarry Mudstone with bands of Wackestone to Packestone

Fossils: Calcispheres, brachiopods, echinoderms and ostracods
Porosity: 1%
Staining: Calcite and ferroan calcite
Comments: Fossil ghosts have neomorphic fine grain bladed calcite crusts and/or iron oxide concentrations within or around them.

Parker Quarry Mudstone with bands of Wackestone to Packestone

Fossils: Calcispheres, brachiopods, echinoderms and phylloid algae
Porosity: 1-3%
Staining: Calcite and ferroan calcite
Comments: Neomorphic bladed calcite crusts and/or iron oxides within or around fossil ghosts.

Lewellen House Packestone to grainstone

Fossils: Brachiopods, phylloid algae, crinoids, ostracods and gastropods
Porosity: 20-30%
Staining: Calcite and ferroan calcite
Comments: Other grains include recrystallized pellets, intraclasts and iron oxide.

Lewellen Window Wackestone

Fossils: Gastropods, brachiopods and echinoderms
Porosity: 1%
Staining: Calcite and ferroan calcite
Comments: Bands filled with coarse calcite spars. There is also a large concentration of iron oxide.

Lewellen House Chinking Mudstone

Fossils: Unidentifiable
Porosity: 1%
Staining: Calcite and ferroan calcite
Comments: Microcracks filled with iron oxides.

Lewellen House Cobble

Fossils: Unidentifiable
Porosity: 1%
Staining: Calcite and ferroan calcite
Comments: Distinct laminations and concentrations of iron oxides.

Lewellen Field Fence Mudstone

Fossils: Calcispheres, brachiopods, echinoderms and ostracods
Porosity: 1%
Staining: Calcite and ferroan calcite
Comments: Fossil ghosts have neomorphic fine grain bladed calcite crusts and/or iron oxide concentration around them.

Lewellen Barn Floor Wackestone to Packestone

Fossils: Brachiopods, ostracods, phylloid algae, calcispheres and echinoderms
Porosity: 20-30%
Staining: Calcite and ferroan calcite
Comments: Concentrations of iron oxides are present.

Lewellen Barn Wall Wackestone to Packestone

Fossils: Brachiopods and echinoderms
Porosity: 20-30%
Staining: Calcite and ferroan calcite
Comments: Cracks filled with coarse cement and mud. Considerable iron oxide stains are present.

Foster Ice House Wackestone to Packestone

Fossils: Brachiopods
Porosity: 1%
Staining: Calcite and ferroan calcite
Comments: Fossil ghosts have microcrystalline calcite crusts, with iron oxide within and around them.

Kobel Barn Packestone to Grainstone

Fossils: Brachiopods, endothyra, echinoids, crinoids, calcispheres, phylloid algae and astracods
Porosity: 20%
Staining: Calcite and ferroan calcite
Comments: Fossil ghosts surrounded by neomorphic calcite and iron oxides.

Chelsea Packestone to Grainstone

Fossils: Echinoderms and brachiopods
Porosity: 15%
Staining: Calcite and ferroan calcite
Comments: Grains cemented by coarse spar, pellets and intraclasts.

Donaldson House (Inner Wall) Mudstone to Wackestone

Fossils: Brachiopods, echinoderms, forams and ostracods
Porosity: 5-10%
Staining: Calcite and ferroan calcite
Comments: Laminated and patchy appearance with concentrations of iron oxide.

Donaldson House (Outer Wall) Wackestone

Fossils: Brachiopods, forams and echinoderms
Porosity: 3-5%
Staining: Calcite and ferroan calcite
Comments: Fossil ghosts surrounded with calcite crusts. Concentrations of iron oxide are present.

END

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